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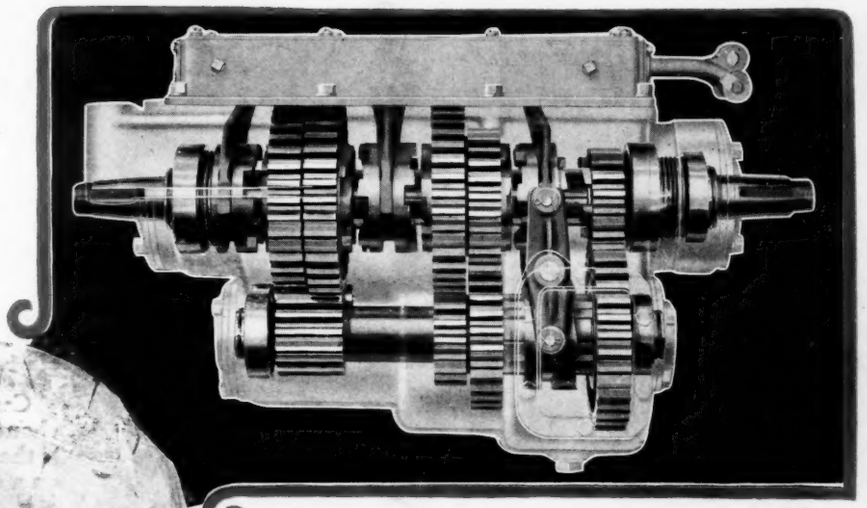

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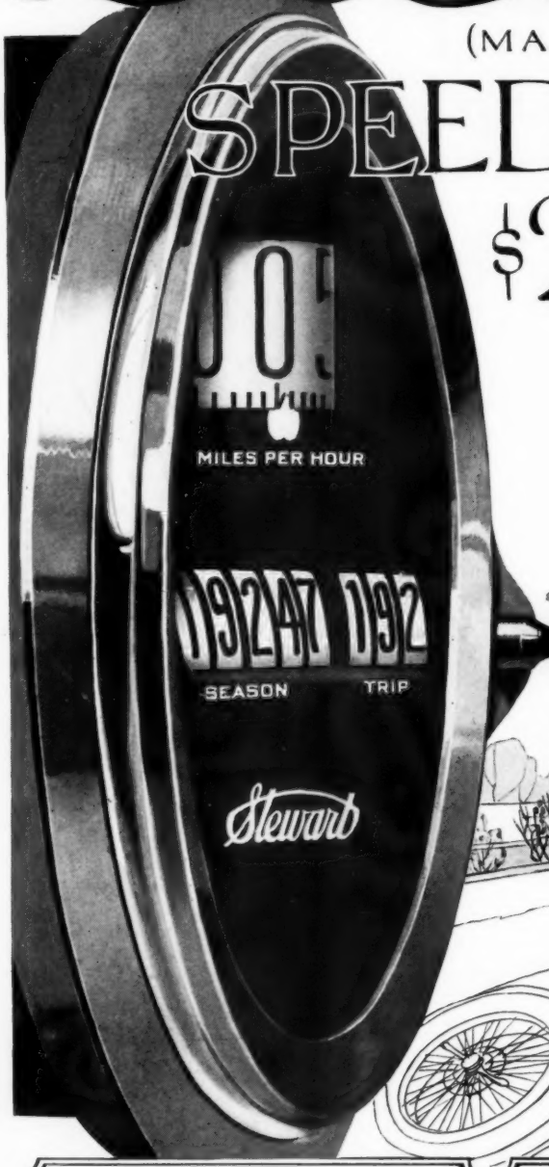

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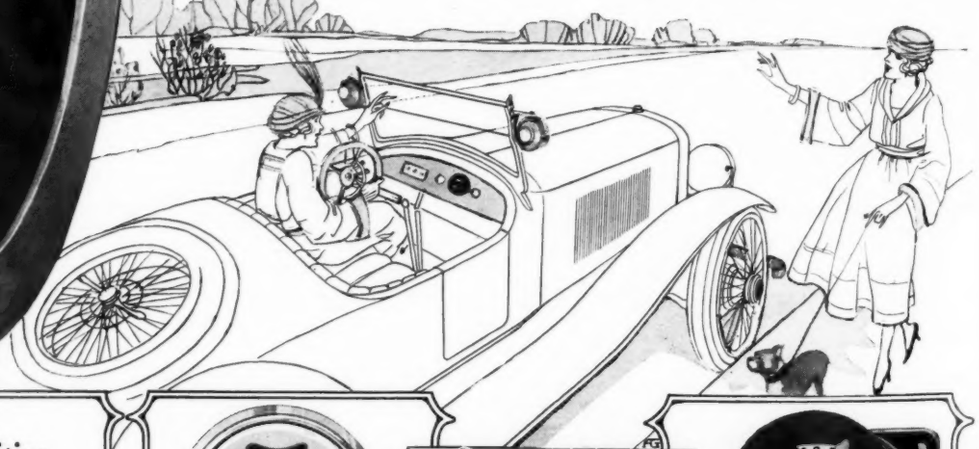

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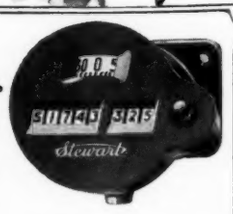

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AUTOMOTIVE INDUSTRIES
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VOL. XLII NEW YORK—THURSDAY, APRIL 22, 1920 No. 17

Have You the Elements of Discontent in Your Plant?

Any strike may serve as a basis for the study of your own plant, if you will go into it from the standpoint of the men, analyzing and looking into your organization with the strike lessons in mind. Some recent walkouts, including the unauthorized outbreak on the railroads, may serve this purpose

By Harry Tipper

THE circumstances surrounding the outlaw railroad strike and the attention which it has received in the newspapers, indicate again the disorder which exists in the ranks of labor, the lack of allegiance to any working object and the difficulty that exists in providing settlements which will operate justly for all employees concerned in the matter. There is no doubt that, in respect of the position of other railroad employees, the yard men and the switch men have some grievances, and have not benefited equally with other branches of railroad employment.

There is no doubt that the strike was partly the result of radical sentiment; there is, of course, always a certain proportion of radical sentiment in labor as in other bodies. The strike, however, accumulated its speed because of the general dissatisfaction of the worker and its beginning rests in the psychological causes which are operating all through the ranks of labor and find their expression when any circumstance offers an opportunity.

The general attitude is indicated by two incidents which occurred in the writer's experience recently.

Just the other morning, some express men with their helpers were moving packages from a warehouse in the downtown district of New York and, in the intervals of getting the packages moved, three of them were standing close to the little office in which one of my friends worked. One of the express men remarked to his helper, casually, in the course of conversation, that it was about six weeks since they had had a strike and that it was almost time to look for another one. The whole expression and its casual occurrence resembled the statement a man might make about a holiday.

Another little incident which happened lately emphasized the point of view expressed in this remark. A few days ago some of the water-front men went on a strike. I asked a young man whom I knew among the strikers, what was the reason for the strike? His reply was interesting. He said, shrugging his shoulders, "Oh, I don't know, I guess they just decided it was about time to have a strike." The attitude of these men in respect to their work struck me as remarkably like the attitude of the youngster to his school. Any legitimate excuse for staying away from school is a point of relief to the average youngster, and these fellows evidently considered that a strike was a legitimate excuse for staying away from work and getting their relief. There was no incentive to these men in the work and no incentive to remain at work if an avenue of escape was provided.

This matter of incentive to work is an important one. It affects so many operations in industry and has so direct a bearing upon production.

In these articles we have stated, from time to time, that there is no incentive for work as such. It is necessary to emphasize the point that there is no incentive to labor in the human being, except as that labor is necessary to the accomplishment of an object. The importance of the object and the visibility of the object to the worker affect the desire for work and the incentive to work with full capacity.

Writers on occupational values to young men in their advice talk much about being interested in your work, but the interest in work comes from being interested in the object of the work and, without a knowledge of the object and a vision of the objective, the incentive is limited to the amount of labor necessary to get by and to provide the amount of money required to live on.

Every man who has acquired any responsibility for industrial operations in connection with his work knows how the necessity for accomplishing an object within a given space of time will drive tired muscles and tired brain into activity until the object is secured. Remove the object from the mental horizon or put it so far away that it is almost invisible, and there is no possibility of developing the same capacity for accomplishment.

As the intelligence of the worker increases, and he becomes aware of his ambitions, the dissatisfaction with the character of his work is not likely to decrease, but is likely to increase unless he can be provided with a sufficient objective, to transfer the performance of the work into the accomplishment of a reasonable object.

Whatever may be said as to the value of the one-man-one-job method of organization, or as to the productive efficiency of the sub-division of labor, it is obvious that the increase in the regularity and monotony of operations, the sub-division of the work into more and more operations, tends to remove the object of the work further and further from the individual worker's horizon and to make the immediate operation less significant to the worker. This is not only true theoretically from a consideration of psychological necessities of the worker, but it is to be observed practically in the establishment of minimum rates of production, in the characteristic elements of production curves and in the large turnover which occurs in most industrial operations. It is obvious that the sub-division of work due to the specializing of operations has been carried sufficiently far to overtake the advantage secured from the machine development, and the result is to be found in the general lessening of production efficiency which was beginning to be felt before the war and which has been accelerated since the war ended.

It is not probable that the sub-division of labor can be eliminated or even largely restricted because of its defects, but its defects should be thoroughly studied and measured so that the rotation of labor can be instituted wherever it is possible, to limit the defects of the system, and where this cannot be done other objectives can be provided for the worker which will to some extent overcome the conditions growing out of this extreme subdivision.

Of course, in strikes like the railroad strike, which was referred to in the beginning of this article, the question of the subdivision of labor does not enter into the matter so seriously. It is rather a question of the disagreeable character of the task, the lack of any sense of loyalty or allegiance, dissatisfaction with the character and object of the work, and a general feeling that the work itself provides no hopeful possibility of increased development.

These things are not expressed, they are more frequently subconscious in their influence upon the action. They arise out of the same subconscious necessities which govern the production conditions we are facing, where the work has been greatly standardized and subdivided; although they are brought into activity by different circumstances. The visible effects are the tendency to quit work for apparently trifling disagreements, the lack of interest in the work, and the lack of any incentive to continue working.

It is not only that the man desires to escape from such work as much as he can without starving, but it is that there is no incentive for good work where there is no visible object in the work. There is a general complaint of the decrease in character of workmanship as well as the decrease in the stability of the worker. These complaints existed in Great Britain for a good many years before the war, and we in this country, were inclined to congratulate ourselves that we did not have the labor conditions which existed there.

What they have been noticing in that country, the decrease in character of workmanship, as well as the decreased stability of the worker, is becoming evident with us and is likely to increase right along. It cannot be stated too definitely that there is no incentive to do good work where the object of the work is not visible, is too insignificant or cannot be understood, and there is no incentive to remain at work under these conditions.

The quantity of production, the amount of production and the stability of production are all involved, and are all affected by these conditions. When the escape from work becomes the most potent desire of the worker, and the work itself begins to look like servitude in the way that school looks to most young children, then it becomes time to study the reasons for this attitude so that production may not be too strictly limited and quality more difficult to maintain.

It is an amazing thing to examine the organization in a larger modern industrial plant and consider the size and detail of the system that must be provided merely for the purpose of insuring quality and accuracy in the work.

Complaining about the lack of interest on the part of the worker will not do us much good, and kicking because the union organizations don't extend their responsibilities in this direction will not be of much service to the manufacturer. If we had a lot of machinery that was not sufficiently productive and that got out of order frequently, we would use all the brain capacity we could command upon the improvement of that equipment. Humanly our industrial organizations are producing badly, they get out of order very frequently and we are under the necessity of reconstructing them constantly, yet, we assume that the troubles can be found without study and the remedies determined by snap judgment or prejudice.

When the individual workman will go out on strike without knowing much about the reasons for it and when he will approach a strike as the expressman did, in the spirit of relief, there is something radically wrong with the character either of the supervision or organization, and something

amiss with our measurement of the factors. Of course, the basis of all the improvements which can be made in the human development of organization is education, the provision of a better ground-work of common understanding. This education must lead into a study that takes in the detail of human labor with the same conscientious attention as that accorded to the study of machinery and worked out in the detail of machine construction and operation.

It makes little difference whether the manufacturer thinks the attitude of labor is justified, production is controlled finally by the human side of industry and the character and amount of the production by the way in which the laborer approaches his work. The attitude of the laborer in connection with his work in reducing the per man per hour production in most plants is keeping the turnover very high and is lowering the quality of the average worker. These effects are sufficiently practical and important to demand the right kind of study.

The sub-division of labor is not justified merely because we use it to its present extent, it must be continued of course very largely, but it should be supplemented by the rotation of labor where possible, and, where it cannot be modified, efforts should be undertaken continually to provide the worker with some other objective, either of organization or department, or in some way that will enable him to transfer the object to his work and overcome the specialized character of his operations.

While a great deal has been written about the industrial organization from the human standpoint in the last two years, little has been said about the attitude of the worker to his work as a daily matter of operation, but this is no unimportant part of the study. It is the individual attitude toward the work which finds its expression in the mass attitude toward strikes, turnover and other industrial interruptions.

The Human Side of Engineering

SPEAKING of the coal industry, Herbert Hoover said recently: "Broadly speaking, here is an industry functioning badly from an engineering, and consequently from an economic and human standpoint." The statement is a significant one coming, as it does, from a man prominent both as an engineer and as a practical business administrator. It reveals a point of view not sufficiently held in the automotive industry; that is, manufacturers do not always realize the direct relation between the engineering and human functioning of a plant. They are often content to work out carefully the engineering phases of production and to care for the human element only as certain parts of the engineering development happen to affect it. Two plants, one large and the other small, manufacturing the same automobile part, give a concrete illustration. The attitude of the managements of the two concerns toward their labor in general is almost identical; each believes that the only way to handle their men is with the "big stick." Yet there is little comparison between the working conditions of the two. If a man had his choice, he would inevitably prefer to work in the larger plant. The cleanliness, the light, the proper arrangement of machinery that makes for safety as well as for efficiency, and the improved conveyors for the handling of material that make work easier as well as more rapid—these things are present in the large plant and are lacking to a considerable extent in the small one.

Considering that the attitude of the two managements toward labor is identical, it is logical to conclude that the better conditions in the large plant are due entirely to their efficacy in aiding production. The large plant has found by experience that certain things, such as good lights and unobstructed passageways, are necessary to efficient production; the small plant is pounding along seemingly ignorant of the fact. If changes ever come in the small plant, they will probably be the result of discoveries by the production manager, that better light, for instance, means better production. Had the large plant approached its production from the human, instead of the engineering standpoint, the same conclusions concerning light, cleanliness, etc., would have been reached. If, however these definite aids to better production, which embody to so large an extent the human element, have been developed by viewing the problem purely from an engineering standpoint, it would seem evident that a careful study and investigation of production from the standpoint of the human element itself would reveal many other factors which would further increase quantity and quality production.

Even in the large plant, however, it is the practice not to study the human side or to attempt to investigate its relation to production; the management simply waits until some production feature falls down because of a conflict with the human side and then remedies that particular defect. Thus, the large plant is no further along mentally than the small plant with all its inefficiency. Both fail to realize that a study of the human element in production problems is necessary

The significant word in the statement of Herbert Hoover, quoted before, is consequently—"if an industry is functioning badly from an engineering standpoint, consequently it is functioning badly from a human standpoint." Moreover, a recent survey of a number of representative automotive plants indicated that the reverse is also true; that is, if the plant is functioning badly from a human standpoint it is found to be functioning badly from an engineering standpoint. Intelligent and honest methods of handling industrial relations were found to go hand in hand with effective production methods.

Aluminum Crankcase Cast on Iron Cylinder Block

ACCORDING to an English patent recently issued to S. S. Guy, the upper half of the crankcase is cast on to the cylinder or cylinders, the latter being placed in the mold for that purpose prior to the casting operation. By this means the rigidity and other favorable features of the unit construction are secured in conjunction with a choice of different materials for the two parts. The cylinder is provided with an extension at the base, and with an outwardly inclined flange. In order to afford an intimate and firm connection with the crankcase to be cast on it, the flange and extension may be rough machined, and for the same purpose the latter may be also formed with a series of annular grooves.

New Engine Has Unusual Oil System and Valve Setting

Several interesting results are obtained from these features of the four-cylinder general purpose engine described in this article. It has the additional feature that the exhaust and intake manifolds are integral, according with the tendency to assist carburetion. Oiling is by force feed.

A NUMBER of unusual engineering features are incorporated in the Turner-Moore, 3½ x 5 in., four-cylinder general purpose engine. This powerplant peaks at 2200 r.p.m., at which speed 37 b. hp. are developed. The torque curve is flat between 800 and 1300 r.p.m. the maximum torque being 83 lb. ft.

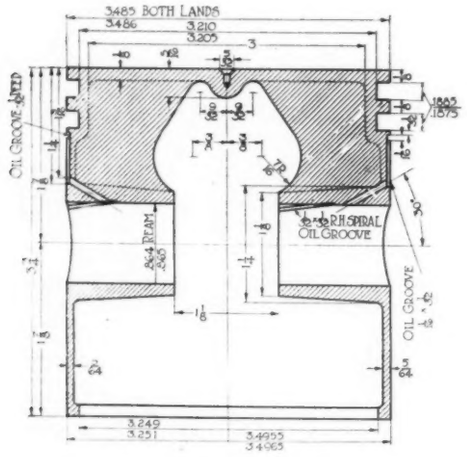
One of the distinguishing features is the hollow crankshaft. It is 2 in. in diameter at all bearings and is used in connection with a complete pressure feed oil system to all bearings and to the timing gears. There are no oil tubes, all of the leads being drilled. Another feature is the tunnel construction in which are housed the camshaft and bearing points of the tappets. This construction is such as to permit the operation of the camshaft and cams in an oil bath.

A rather unusual feature is the accentuated inclination of the valves. The purpose of this is to secure better scavenging, inasmuch as it permits the exhaust gases to be swept off the top of the piston directly into the exhaust passage and also to secure a shorter combustion chamber. The inclination also permits of increased water space around the valve stem guides and brings the spark plugs closer to the center line of the pistons.

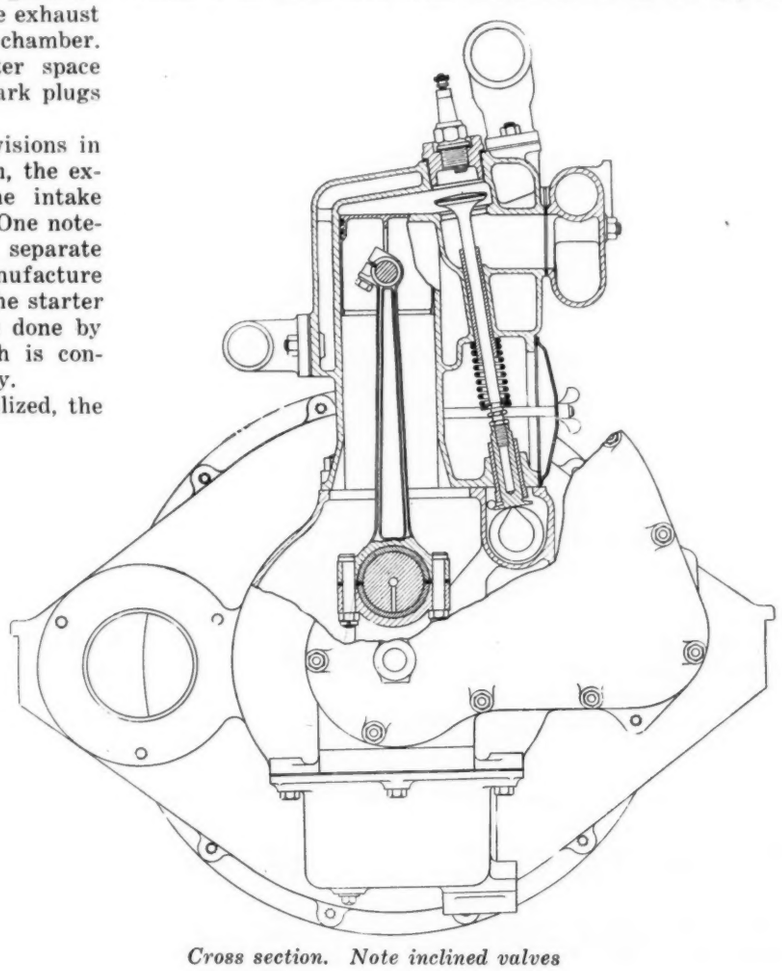
In accordance with the tendency to make provisions in the intake manifold for assisting the carburetion, the exhaust and intake manifolds are integral. The intake manifold is on top and its lower side is heated. One noteworthy manufacturing feature is the use of a separate bell housing casting. This permits easier manufacture and cheaper castings. Another feature is that the starter flange can be furnished on either side. This is done by simply shifting the boss on the pattern, which is constructed so that this can be accomplished readily.

Either battery or magneto ignition can be utilized, the drive, consisting of helical gears and a vertical shaft being located at the rear of the cylinder block. A balanced drive is secured by putting the gear oil pump on another vertical shaft which extends to the bottom of the oil pan.

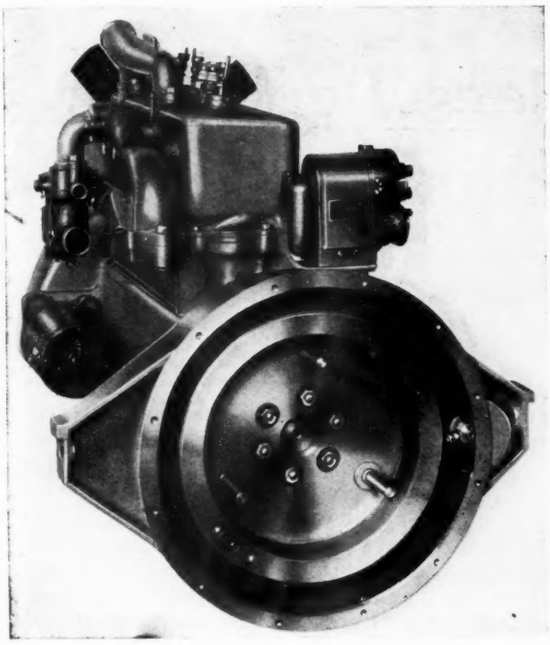
The cylinders are cast in block of semi-steel. The crankcase is of grey iron with provision made on the left side, front end, for any standard generator with No. 2 S. A. E. mounting flange. The pistons are semi-steel, the piston pins being held rigid in the connecting rod with the bearings in the piston. The sectional drawing of the piston herewith shows that it is heavily webbed, the web, however, being split at the center so as to avoid distortion due to expansion. The piston is 3¼ in. in length overall and has two rings located at the top end. Below the lower ring there is an oil groove 1/32 in. deep around the entire piston and at the point directly above the piston pin there is a slot cut in the side of the piston, the lower end of which is in connection with a drilled lead to the top of



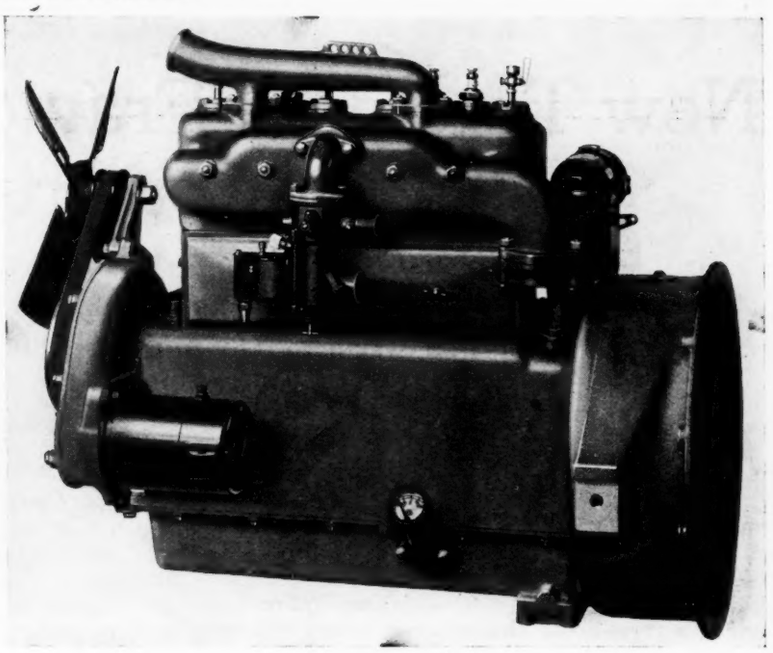
Section through Turner-Moore pistons, showing web construction and oil relief



Cross section. Note inclined valves



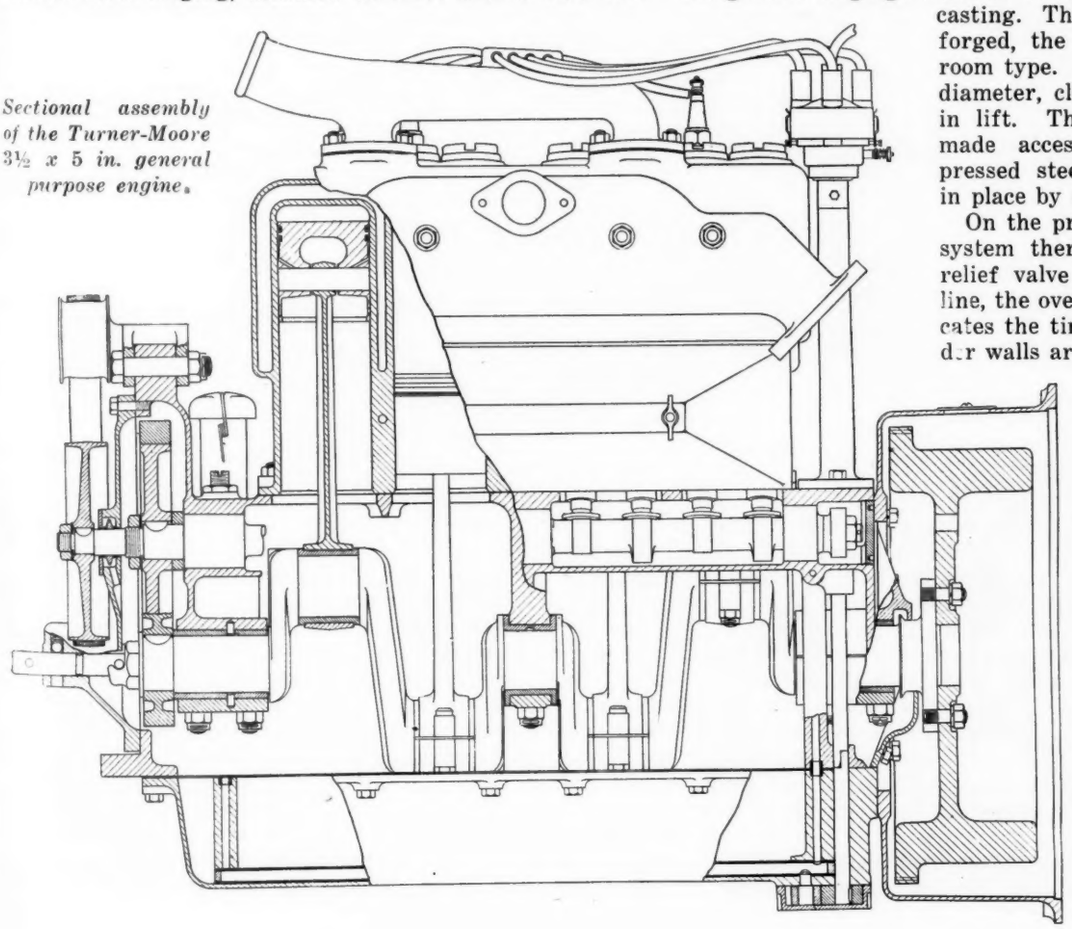
Turner-Moore engine, showing transverse magneto mounting, making brake adjustment accessible; battery ignition optional



Side view of Turner-Moore engine, 3½ by 5 in type, showing integral intake and exhaust manifold, carbureter and generator mountings

the piston pin bearing. The effect of this is to force oil to the top of the piston pin bearing on every up stroke. The oil groove is 1/16 in. wide and 1/32 in. deep.

The connecting rods are 10 in. center to center, I-beam section, and the crankshaft is a 40 point carbon, heat treated steel forging, mounted on three bronze back babbitt-lined bearings, equipped with laminated shims for adjustment. The bearing dimensions are (front to rear): 1⅞ x 3⅛, 1 15/16 x 1¾ and 2 x 3¼ in. The connecting rod bearings are 2 x 2 in. The valves are driven by a set of three helical gears, the crank and generator gears being steel forgings and the camshaft gear a semi-steel casting. The camshaft is integrally forged, the followers being mushroom type. The valves are 1½ in. diameter, clear opening, with 5/16 in lift. The valve adjustment is made accessible by removing a pressed steel cover which is held in place by a nut and lock nut.



Sectional assembly of the Turner-Moore 3½ x 5 in. general purpose engine.

On the pressure feed lubricating system there is a ball check and relief valve at the end of the oil line, the overflow from which lubricates the timing gears. The cylinder walls are lubricated by oil mist thrown from the connecting rod bearings, and the remaining bearings are taken care of by direct pressure feed. Cooling is by thermosyphon or pump circulation, as desired. The water jacket space is exceptionally large, holding 7 qt. of water. Pump circulation is required only for extremely heavy duty work, such as tractor service. The weight of the engine, with cast iron crankcase, oil pan and flywheel housing is 440 lb.

New Tractor of Frameless Type Has Unit Construction

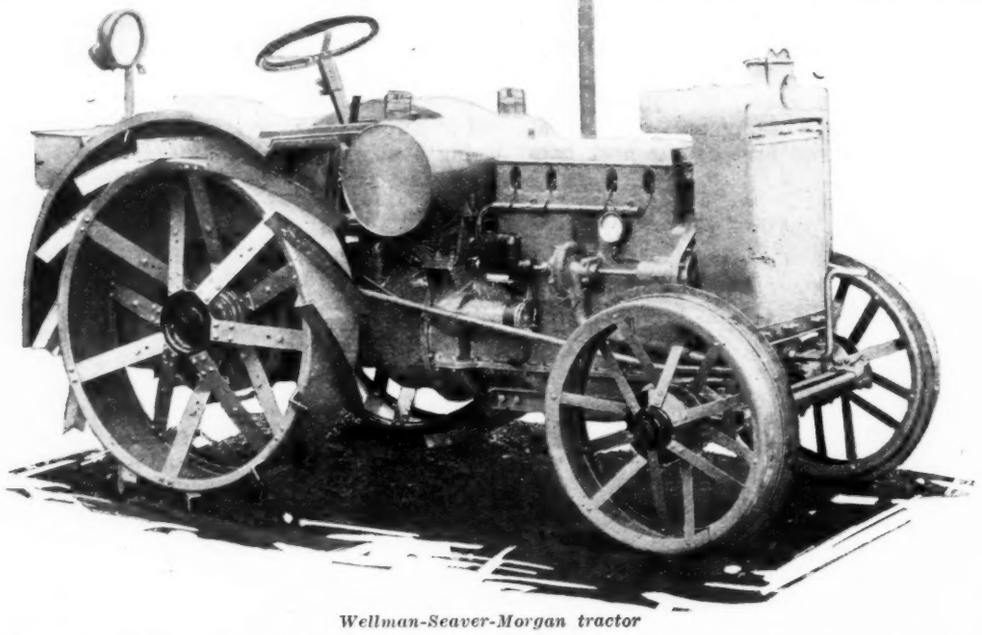
The description herewith sets forth the design features of one of the new models on exhibition at the recent Kansas City show. The engine for this machine was described in the issue of April 15.

ONE of the most attractive designs among the new tractors at the recent Kansas City Show was the W-S-M, manufactured by the Wellman-Seaver-Morgan Co. The machine is new all through, including the engine, but the engine and the rest of the tractor are the work of different designers and the two will also be built by different departments of the works. The tractor is the design of John Riise. It is of the frameless or backbone type, has a three-speed change gear, a first reduction by worm and wheel with final drive by spur gears, and is remarkably short for the size of engine carried, the wheelbase being only 75 in.

The unit principle has been carried out, the whole assembly consisting of nine different units, as follows: The engine unit with radiator, fuel tank and air cleaner; the front axle unit, including the built-up axle, cross spring, steering knuckles, radius rods, bearings, thrust washers and wheels; the rear axle unit, including the axle, bull gears, housings, bearings, thrust washers, wheels and brakes; the clutch unit, including the clutch brake; the main case unit, comprising the change speed gears and control; the differential unit, including the worm, worm wheel, differential and bull gear pinions and differential oiler; the pulley unit, comprising the pulley shaft, spiral bevel gear and bearings; the steering gear unit, including the case, bevel segment, pinion, column, arm, steering wheel, seat spring and seat, and the fender unit, which combines in one the fenders, platform and drawbar.

By removing 12 bolts, the engine, rear axle and differential units can be removed from the main case, each independently without disturbing any of the other units. If the powerplant as a whole is removed, the rear portion of the tractor balances on the axle in such a way that it can be rolled around on the rear wheels.

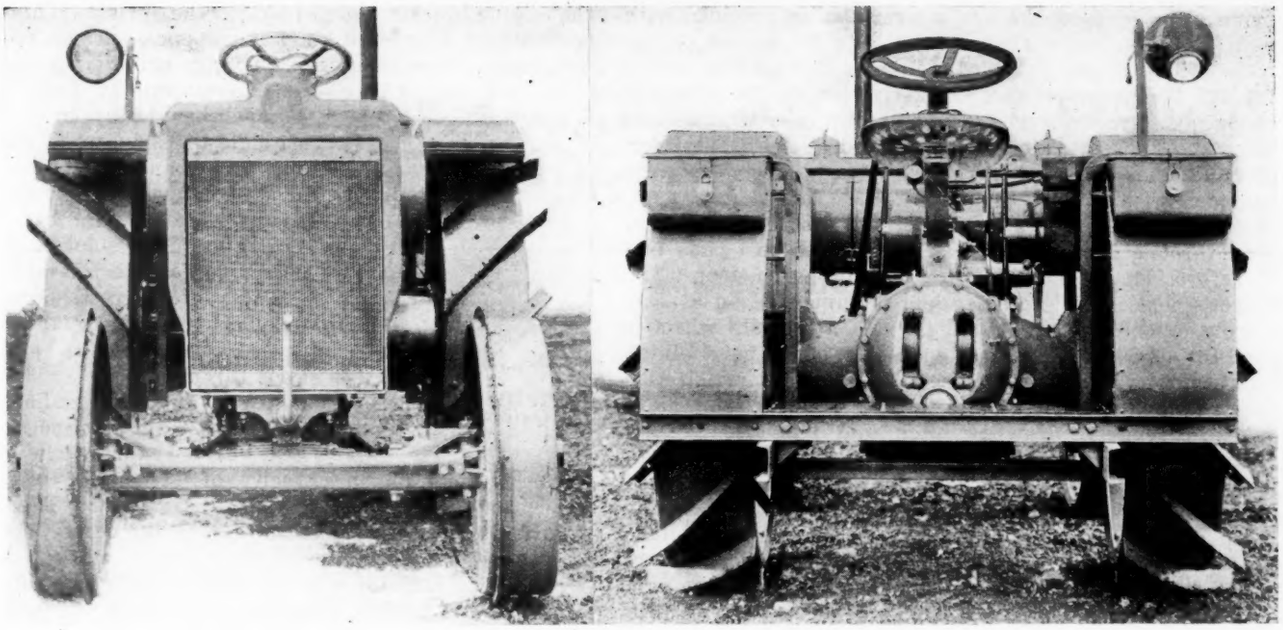
The engine is of the 4-cylinder block type, 4¾ x 6 in., and has been described in a recent issue. An air washer is to be fitted, but this was not installed on the model exhibited at Kansas City. Ignition is by a Bosch high tension magneto with impulse starter. An electric starting and lighting equipment of the 12 volt two-unit type is standard equipment. A centrifugal governor holds the engine speed down to 950 r.p.m. Lubrication is by force feed to all engine bearings, all oil conduits being cast integral with the engine, so there is no outside piping to come loose and develop leaks.



Wellman-Seaver-Morgan tractor

The dry disk type of clutch is used, comprising eight disks. The clutch is held in engagement by eight sets of two concentric springs, the clutch being non-adjustable.

The transmission is of the sliding pinion type and gives three forward speeds and one reverse, the intermediate speed being the direct drive, which is used for ordinary plowing. When this is in engagement there are only two reductions in speed from the engine crankshaft to the driving wheels. The low speed is 1½ m.p.h., the intermediate or plowing speed 3 m.p.h. and the high speed 6 m.p.h. There is only one countershaft in the transmission and there are sliding gears both on the main shaft and on the countershaft. The direct drive is obtained by means of an internal type of positive clutch. There is a sliding pinion on the



Front and rear views of W-S-M tractor

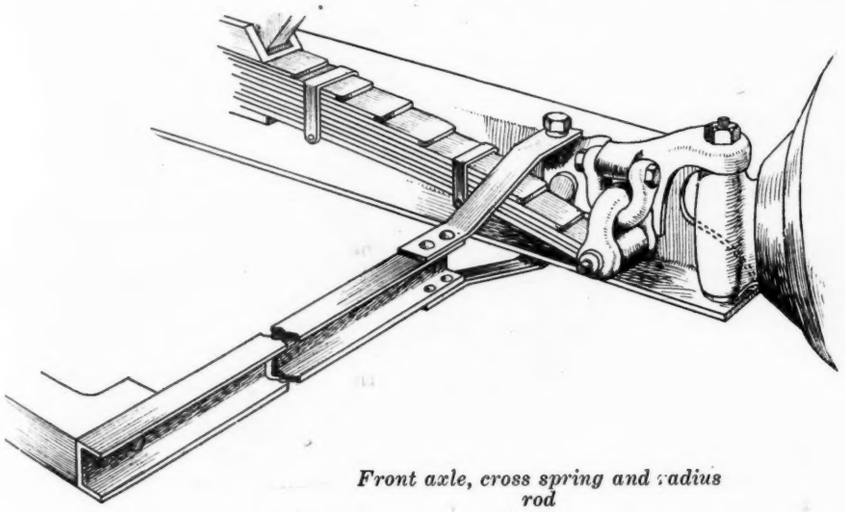
main shaft, which when in its most forward position gives the direct drive. Its next position to the rear corresponds to the reverse drive and its rearmost position to the low speed. The high speed is obtained by shifting a sliding gear on the countershaft into mesh with a pinion on the main shaft. The teeth of this pinion are splines cut on the shaft.

The housings for the clutch, transmission and the differential are all semi-steel castings. The differential is a very compact unit and, together with the final reduction rears, is supported by a gear carrier which is bolted to the rear of the axle housing. There are two large ball bearings in the final drive, as well as Hyatt roller bearings. The ball bearings are held in rings with lugs on opposite sides by means of which they are bolted against a seat in the casting. A reduction of 11 2/3 to 1 is obtained by means of the worm and wheel and the total reduction between engine shaft and rear wheels is 23 to 1 for the high gear, 46 to 1 for the intermediate and 92 to 1 for the low gear.

The assembly of the tractor starts with the transmission case, which contains the change gears. The engine is assembled on this from the front and the worm and differential from the rear, after which the axle housings are secured to the sides of the differential housing. As already pointed out, the belt drive forms a separate unit. The secondary shaft of the change gear extends forward through a partition in the housing and at its forward end carries a bevel pinion meshing with a bevel gear on the belt pulley shaft. The bevel gear on the power take-off shaft can be moved into and out of mesh with the driving pinion by means of a lever having a motion of 170 deg. which locks the gear in position.

Individual brakes are fitted to the rear driving wheels. These insure more positive steering in loose soil than would be possible with the steering gear alone, and in addition they are of service in correcting any tendency for the wheels to leave the furrow in plowing due to the better grip on the ground of the wheel traveling in the furrow. A slight pressure on the pedal of one of the brakes tends to correct this tendency.

Mounted on top of the gear box is the steering gear, which is of the motor truck type. The driver's seat is mounted centrally on the transmission case and the control devices are conveniently arranged on both sides. A feature of the individual brakes is that they can be operated either



Front axle, cross spring and radius rod

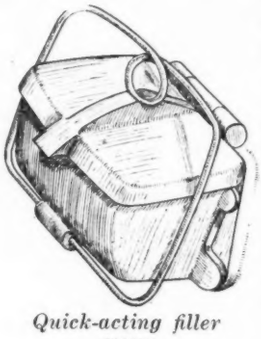
Front wheel with skid ring

by hand or by foot, the brake levers being provided with pads so as to make them controllable by means of the foot. There is also provided a simple chain locking device for the brake levers, this consisting merely of a length of chain secured to a crossbar which can be extended rearward and hooked to the slotted top end of the brake lever. The clutch is operated by means of a similar lever also provided with a pedal pad, and can be locked in the out position by means of a hook over the crossbar. The engine throttle is operated by a pedal with two pads and therefore can be operated by means of either foot. The driver's seat is of large size and is supported on a rearwardly extending bar. A 22 in. cast aluminum wheel is used for steering. The steering gear is of the bevel pinion and sector type and is inclosed in a housing which also forms a hand hole cover plate for the transmission.

Wheel fenders, drawbar hitch and platform are all formed in one and are supported by 3 in. and 4 in. channels. Two tool boxes with locks are conveniently mounted on the fenders, one of these boxes serving for tools for the implements and the other for tractor tools. The battery box is mounted on the inside of the wheel house.

A Z bar is used in building up the front axle, the axle ends being of cast steel. A plain pivot pin is screwed into the cast end and secured by a lock nut. There are bushings in the knuckle at both top and bottom, with a nut on the lower end of the knuckle pin. Under this nut comes the flange of the Z bar, then follows another nut, hence the knuckle pin is used in holding together the parts of the built-up axle. A case hardened cup is provided to obtain the proper bearing surface between the bushing and the steering head, this cup also excluding dirt. Another cup is provided at the bottom of the knuckle for the same purpose. The steering motion is limited by the steering arm coming against the Z bar.

The forward end of the tractor is mounted on a half elliptic cross spring with universal shackles at both ends, the shackles connecting to the cast axle ends. The spring seat at the center of the spring has a supporting pin 1 in. in diameter which swivels in the spring, being clamped in the engine bracket which rests on the spring. This pin is turned with a grooved knob at one end so it can be easily withdrawn when necessary. To give stability to the front axle, connection is made by two channel bar radius rods which straddle the axle, while the rear ends are connected to the front of the flywheel housing by means of a 1¾ in. ball joint. This gives an absolutely flexible mounting for the forward end.



Quick-acting filler cover

The radiator rests on an extension of the cam gear housing cover, being held in place by two through bolts. The cast housing of the radiator is shaped to form a tunnel for the gear driven fan. The entire cooling system has a capacity of 17 gal. of water, of which 6 are carried above the radiator core. There is a partition in the casting at the top of the core. The pipe connection to the radiator at the top is by a through bolt. A large size radiator filler is provided, the cap of which is hinged and held in place by a wire hoop. The core of the radiator is of Modine manufacture.

A supply of 25 gal. of kerosene and 5 gal. of gasoline can be carried in the fuel tank, which is mounted on a saddle over the flywheel housing. This tank is of cylindrical form and is provided with quick acting tank covers similar to the radiator cover in construction.

Starting and lighting switches are mounted on the crossbar behind the fuel tank to which reference has repeatedly been made.

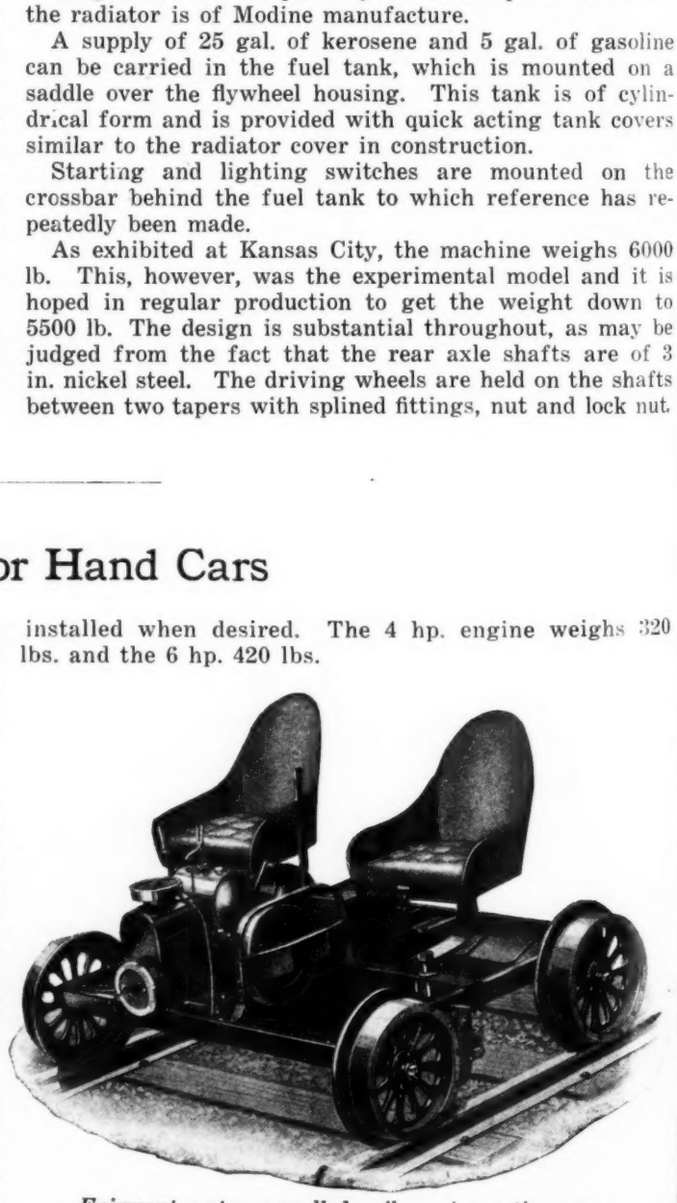
As exhibited at Kansas City, the machine weighs 6000 lb. This, however, was the experimental model and it is hoped in regular production to get the weight down to 5500 lb. The design is substantial throughout, as may be judged from the fact that the rear axle shafts are of 3 in. nickel steel. The driving wheels are held on the shafts between two tapers with splined fittings, nut and lock nut.

Substitute for Hand Cars

MANY of the old-fashioned hand cars used by section gangs are being equipped with engines, or being replaced with new cars of the motor type. In fact, this comparatively new field of the automotive industry is said to show signs of broadening in the near future and further development may be expected.

In connection with this form of transportation, trailers or push-cars are being used to some extent, and are loaded with ties or other material for section work and readily moved to the scene of operations. Railroad motor cars are also being used more than formerly, and have the advantage of placing the inspector close to the rails and enabling him to cover conveniently a large extent of trackage in a day. As such cars can be stopped within a distance of two or three rail lengths, collisions are avoided even where traffic is heavy, for the railway motor car is readily reversible and easily sidetracked.

An engine that has been utilized extensively in this field is a small 4 and 6 hp. type built by the Fairmont Gas & Ry. Motor Car Co., who not only convert old handcars but also make the new motor substitutes. Battery ignition is ordinarily employed, but a magneto is installed when desired. The 4 hp. engine weighs 320 lbs. and the 6 hp. 420 lbs.



Fairmont motor-propelled railway inspection car

The Marine Engine as Great Britain Has Developed It

This review of English practice was written after the Olympia show at London. Some of its recommendations and criticisms might be applied to the American output. Mr. Bourdon's suggestions concerning the semi-Diesel engine are interesting and timely.

By M. W. Bourdon*

QUITE a small minority of British motor boat and marine engine manufacturers cater to the prospective purchaser who requires a lightweight four or six-cylinder engine on the lines of those utilized in private cars. The majority have followed or are running on lines parallel with truck engines; their products are medium and heavy weight units designed to run at normal speeds of between 600 and 1000 r.p.m. with gasoline or kerosene as fuel. There is no evidence of any attempt to keep down weight of either stationary or moving parts. Durability above everything else has been considered; comparatively low specific output and a low rate of revolution with direct drive to the propeller are common features. Few attempts are apparent to clean up exterior design and to provide all moving parts with automatic lubrication.

The average British marine engine, in fact, resembles the truck engine of 10 years ago far more than it does the car engine of 1920. There are exceptions to this general rule. In isolated instances, a type running at somewhat higher speed has been evolved, and there is an incipient tendency to follow airplane practice in utilizing reducing gears—an indirect drive—between crankshaft and propeller. Thorneycroft, for example, has attained increased propeller efficiency in this way, and, with a crankshaft speed of 1400 r.p.m. in one type of engine, has a propeller speed of 350 r.p.m. The transmission loss in the reduction gearing is amply compensated for by increased propeller efficiency, quite apart from the better results in power development by the engine.

The tendency just outlined applies primarily to sets intended for craft of slow or medium speed, for the advantage of reduction gearing has yet to be demonstrated in 20 to 30 knotters and in boats of even higher speeds. But when one realizes than an engine speed of 1200 r.p.m. is considered high enough for even the fastest of pleasure craft with direct drive, it is quite evident that in launches and small cruisers, whose top speed through the water is 8 to 12 knots, an advantage would accrue if reduction gears gave a propeller speed of under 500 r.p.m. Therefore, it would seem to follow that better results would be obtained by maintaining that lower propeller speed with an engine running at 1800-2000 r.p.m.

Automobile Types of Engines

It has been found advantageous to adopt high speed steam turbines with reduction gears in large vessels, so why not follow the same line of progress and utilize the lighter, more efficient and higher speed automobile type of engine with a reducing gear, instead of continuing to use with direct drive the heavy, inefficient and low speed 1910 truck type of power plant? That appears to represent the line of thought of a small section of British motor boat engine designers. But the majority still seem to be satisfied with the line of least resistance—an unsatisfactory compromise between a low inefficiency of propeller and engine.

Mounting the Accessories

Admitting for the moment the advantages obtained in the way of accessibility by extended drives for such units as the magneto, water pump, oil pump, etc., bringing these items where they can be reached and removed if necessary without disturbing any other part, there is no excuse for the almost unlimited number of subsidiary bearings and details which require periodical if not frequent attention with an oil can. The use of compression grease cups for the journal bearings of crankshafts, a feature evident in quite a number of engines, seems to imply a decided lack of confidence in the system of oil distribution provided by the oil pump, although one maker informed the writer that he used the greasers, not so much for the supplementary lubrication they supplied, but because the grease prevented oil from leaking from the outer ends of the bearings.

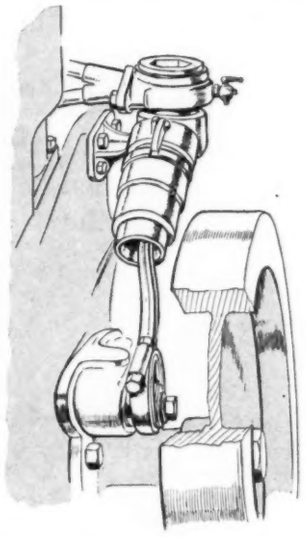
But, whatever the failings of British motor boat engine designers in regard to the reduction of weight, hesitancy to utilize higher engine speeds, and failure to provide a neat arrangement of exterior details, there can be no gainsaying the fact that, taken generally, they provide a reliable and durable outfit. The majority, too, have evidently given more than casual consideration to the matter of internal lubrication; it is unusual to find a simple splash system relied upon, and in a great number of models the oil is forced to the main journal bearings and through a drilled shaft to the big-ends. One or two carry the lubricant under pressure to the piston pins.

Ignoring two-cycle engines, which almost universally have splash lubrication, the oil being introduced either from a drip feed into the induction pipe or mixed with the gasoline in the fuel tank, the following percentages of lubrication systems may be applied:

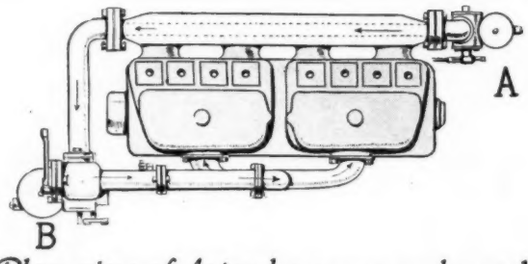
Drip feed and splash, 20 per cent.
Circulating splash (troughs for main and big-end bearings) 20 per cent.
Forced to journals and troughs for big-ends, 25 per cent.
Forced to journals and big-ends, 30 per cent.
Forced throughout, including wrist pins and camshaft, 5 per cent.

Mr. Bourdon is the engineering correspondent of AUTOMOTIVE INDUSTRIES *in the United Kingdom.*

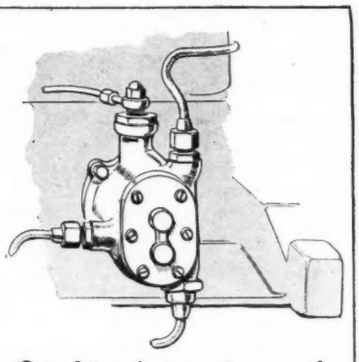
Fittings of the British Marine Engines



Ailsa Craig eccentric piston type water pump.

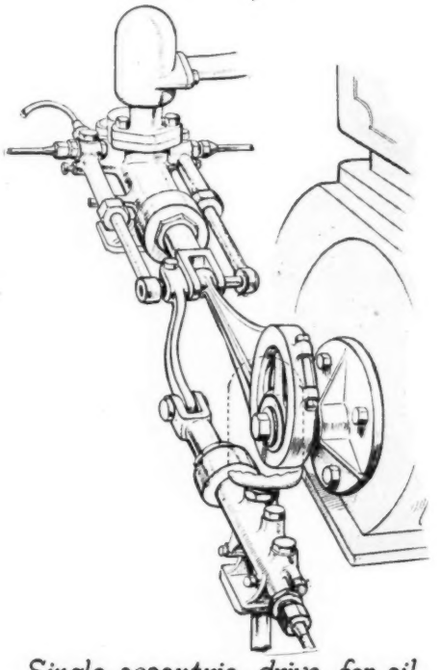


Plan view of Aster kerosene and gasoline induction system. A, kerosene carbureter; B, gasoline carbureter with cut off valve independent of throttle.

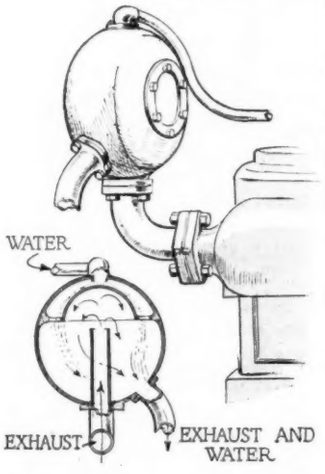


Combined gear type oil pump and plunger pump for fuel pressure on six-cylinder Wolseley marine engine.

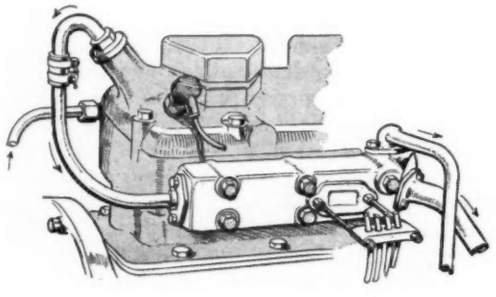
Cast steel camshaft of T-head Spherota marine engine.



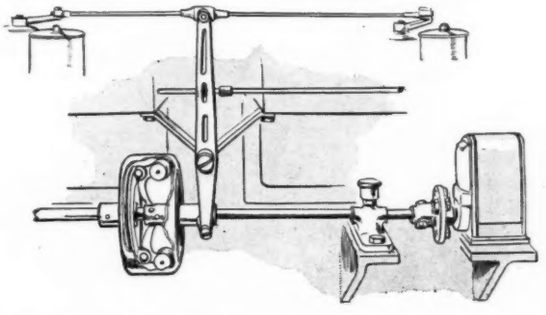
Single eccentric drive for oil, fuel pressure, water circulating and bilge pumps on Djinn engine.



Perspective view and section of Atlantic exhaust cooler.



Watercooled exhaust manifold on 7 h.p. four-cylinder overhead valve Wolseley.



Centrifugal governor of throttle on magneto drive shaft of Atlantic marine engine.

Attempts have been made by individual manufacturers to standardize a definite number of types, usually two or three, the units of each type having the same bore and stroke with as many interchangeable parts as possible for the varying number of cylinders—1, 2, 3, 4 and 6. As a result, the block cast four cylinder engine is rarely seen, while a six cylinder block does not exist. Cylinders are either separate or pair cast, although the latter are in the majority. Approximately 20 per cent have T heads, the remainder being divided as follows: L heads 58 per cent, superimposed valves 14 per cent, both valves overhead 8 per cent.

It is quite usual to find the valve stems of T head, L head and overhead valve engines without protection or any pretence made at enclosing them. While, of course, there is no likelihood of dirt and dust having ill-effect where valve stems and springs and tappet heads are exposed, there are obviously advantages to be gained in the way of noise reduction and cleanliness by enclosing these parts. One maker, Parsons, who has exposed valve springs, deposits on them a coating of copper, presumably to protect them from corrosion by sea water and salt laden air.

Crankcases and Cylinders

Cast iron is practically universal for crankcases, aluminum being used on a very few of the lightest engines only, either those for fast sea-going craft or for launches to run on fresh water rivers. Aluminum pistons appear in but two instances, and those are extremes in point of size—the 3 hp. outboard Watermota and the Green aerocum-marine engine ranging from 100 hp. to 450 hp. with six to eighteen cylinders. Strangely enough, too, these makes are the only ones embodying a cylinder construction different from normal, both having copper water-jackets.

Detachable cylinder heads and cylinders cast with the top half of the crankcase are rarely seen, but this fact will have been surmised from the mention of the prevalence of multi-cylinder engines made up with separate and pair cast cylinders. But although the provision of easy access to the combustion chambers is rarely in evidence, there is a general use of large plate-covered openings in the crankcase sides, to allow the connecting rod bearings to be dismantled and the rods and pistons removed without disturbing the cylinders or other parts of the engine. One firm goes so far as to claim that the main journal bearings of the crankshaft can be taken up through the crankcase openings.

In regard to connecting rods, these almost invariably have phosphor bronze bushes in the small ends for a hollow piston pin secured in the piston bosses, and the favorite method of preventing rotational and end movement of the pin is to provide an additional piston ring in a groove in line with its axis. Incidentally, scraper rings are almost non-existent. For the big-ends, a pair of bolts, one on each side, are nearly always considered sufficient, and even in engines of 5 or 6 in. bore, one rarely observes the four bolts which British truck engine makers consider advisable with even smaller cylinder dimensions. And yet inertia forces must be more severe, even at 1000 r.p.m., considering the greater weight of pistons and rods in the usual marine type.

Crankshafts are generally massive and more frequently than not have a bearing between each pair of adjacent throw. It is not at all unusual practice to cast the crankcase in one piece, supporting the shaft at the rear by a detachable end plate which forms the bearing housing, the other journals having detachable caps secured by long bolts passing down from the top of the casting. In such designs there is no removable underpan or sump, access to the interior of the base being by way of the side openings.

There is a distinct tendency observable to place the flywheel at the front end of the crankshaft. This results in a compact arrangement with a unit system of crankcase and reverse gear housing.

The great majority of British marine engines are fitted up or sold to run on kerosene, but the means provided for vaporizing this fuel vary considerably. In a few cases no heating occurs other than that obtained by a hot-air supply taken from a large muff around the exhaust manifold or pipe. Usually, however, there is a more effective provision, consisting of a vaporizing chamber heated by the exhaust gases immediately they find exit from the cylinders. But beyond exhaust heating systems, with many variations in design all having the same or a similar effect, there is nothing startlingly new in the way of kerosene vaporizers. In half a dozen or so makes of heavy duty engines, the heating chamber is designed for the application of a blow-lamp for engine starting. Usually provision to this end consists of a cast-on bracket for the lamp, from which the flame can be directed on to a portion of the exhaust jacket. But in one instance two concentric compartments—for mixture and exhaust respectively—have an open ended central tube up which the flame from a vertical lamp can pass and impinge upon baffles within.

Generally, however, gasoline is depended upon for starting from cold, the same carbureter and float chamber being fed with either fuel by means of a two-way cock where the pipe lines unite. It is exceptional to find two separate and distinct carbureters used, although Aster has this kind of arrangement, the mixture from both leading eventually into the same induction manifold from which the gasoline mixture supply can be cut off by a special valve; the kerosene in this case is vaporized by carrying the outlet pipe from the one carbureter through the full length of the exhaust manifold.

A water drip with kerosene as fuel is also exceptional, though it is provided for in a few instances. But a drip tray beneath the carbureter, whether gasoline or kerosene is to be used, is frequently seen. One or two of these are elaborate fittings of cast iron or aluminum, with fine mesh safety gauze across the top of the tray and a drain pipe through which the overflow fuel can be carried away into a special receptacle instead of leaking into the bilge water.

Distribution gearing consists almost without exception of straight toothed pinions. The silent type of chain is not used and skew gearing only appears for the right angle drive to a transverse shaft when the latter occurs.

The Use of Starters

A centrifugal type of governor acting on the carbureter throttle is quite normal on all except the smallest or lightest type of marine engine; approximately 65 per cent are so equipped. Impulse starters, on the other hand, are standard on only 30 per cent of engines; this, too, despite the fact that heavy engines with crank starting, magneto ignition only, and generous dimensions as to bore and stroke are mostly in question.

In the prevailing medium and slow-speed engines, the piston type of water circulating pump is greatly in favor; it is driven by an eccentric, usually either on the crankshaft or on the camshaft extension, through a coupling rod. It has a stationary (non-oscillating) cylinder cast in phosphor bronze, with non-return valve and piston of the same material; the piston has no rings, leakage being prevented by gland packing at mid-stroke with a two, three or four-bolt exterior flange adjustment.

Occasionally the eccentric serves to actuate other pumps

and, in one instance, the oil, fuel, water and bilge pumps are grouped in a unit casing and actuated from the eccentric. An air bottle, to prevent "hammering" by equalizing discharge pressures, is not infrequently provided, but it is not usual practice to fit one. Approximately 25 per cent of the engines have these piston pumps for water circulation, 50 per cent the gear wheel pattern, 5 per cent pure centrifugal, while 20 per cent have the eccentric type.

Eighty per cent of British marine engines have gear type oil pumps, which are rarely found inside the crankcase. In fact, a submerged pump is quite exceptional; they are generally arranged in front of the distribution casing and driven either from an extension of the camshaft or by roller chain from the end of the crankshaft. Occasionally they are located low down outside the crankcase and driven by skew gearing and a vertical shaft from the camshaft on that side. Oil filtration is generally carefully provided for, not only as regards filter dimensions, but in making it accessible and capable of being removed and cleaned without draining off the contents of the crankcase or sump.

Fifty per cent of the engines have some means of cooling the oil. The usual practice is to carry the water pipe through the crankcase sump in its run from the outboard inlet to the pump; the internal piping is generally straight, but one or two engines have coiled or curved lengths in order to expose a greater cooling area to the oil. One engine has a false bottom to the oil sump, which covers a second sump through which the water passes on its way to the pump.

Brooke engines have oil jackets to the induction manifolds, a double purpose being served, that is, the oil is cooled and vaporization assisted. The British Admiralty insist upon engines for their use having a separate oil cooler and in the largest Brooke model this is retained as standard. It is a concentric cylindrical fitting, through the outer jacket of which passes the intake water, while the oil is drawn or forced through the center.

There is room for improvement in reversing gears, which, speaking generally, give more trouble in use than engines. The most prevalent type is a separate unit embodying a friction clutch for the forward (direct) drive and a system of epicyclic gearing to provide the reverse, with a band brake applying to the outer member.

Reversing Gears

Two recent designs of reversing gear show considerable variations from normal. In one, either the thrust or the pull from the propeller is relied upon to provide the end pressure for one of two cone clutches, one for forward drive and the other to displace the band brake of an epicyclic reverse system. In the second variation, engine torque keeps the friction clutch engaged; for this purpose the drive passes through a cylindrical extension of the driven member in which are helical slots accommodating projections from a concentric inner sleeve bolted to the flanged front end of the propeller shaft. Thus, torque has the effect of imparting end thrust to the clutch as soon as the surface of driving and driven members are brought into contact by the operation of the control levers. The provision of angles of helix and cone that will give a non-slipping drive and yet one that will not jamb calls for some nicety in design and precision in manufacture.

In the Vickers-Elma reversing gear an epicyclic system with bevel pinions is used, and both the forward and reverse clutches are of the magnetic type. Switch control displaces the operating lever, the switches being moved by a small hand lever which is coupled to the engine throttle and moves the latter toward the closed position before either switch is moved to the "off" or neutral contact.

While it cannot be said that British motor boat engines display any marked development in design since the prewar period, there is clear evidence of a desire to get down to a smaller range of models of a standardized type. Prior to 1914 many firms of engine builders—for they were "builders" then rather than "manufacturers"—had an almost unlimited range of models, each one having varying characteristics and dimensions of bore and stroke differed without apparent reason. Now there is an endeavor to specialize on a limited number of types, though some firms still offer as many as eighteen or twenty different models.

From the foregoing it will be surmised that quantity production does not exist. Outputs of more than six or eight engines per week are exceptions, and as a result prices generally rule high.

The Semi-Diesel Engine

Engines of small power usually have one or two cylinders. The two-stroke cycle predominates in the lighter types, while the four-stroke is almost universal for the heavier boats and for commercial craft. The latter statement takes no account of the semi-Diesel type of engine and this is hardly as it should be, for quite a number of firms are now making small crude-oil plants, ranging from 5-6 hp. upward, for large pleasure boats, fishing and harbor craft and industrial purposes generally.

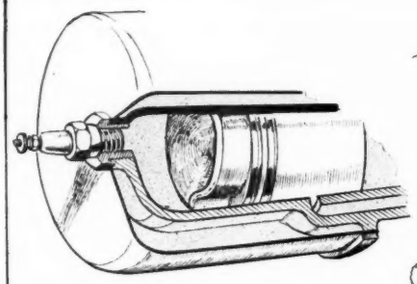
The semi-Diesel engine, with a two-stroke cycle, burning heavy fuels is, in fact, attracting the attention of a great many British marine engine makers and big engineering firms as well. On the one hand we have Brooke, Aster, Joy and Ailsa-Craig, who have hitherto made nothing but light and medium weight gasoline and kerosene engines standardizing single cylinder crude-oil engines of approved designs; while at the other end of the scale are such well-known engineering concerns as Beardmore, Vickers, and others, who have previously touched this side quite half-heartedly, organizing to turn out in quantities a similar type of plant up to 1000 hp., with ability to supply far larger equipments for ocean-going cargo boats by duplicating or triplicating the standardized engines. Other engineering firms, Babcock & Wilcox, for example, are at present still merely agents for Swedish and other European makers of semi-Diesels, but are organizing to build under license in England.

This type of internal combustion engine is, without question, interesting a great many of the old-established marine and general engineering enterprises which hitherto have kept to steam plants, and, although in the larger sizes the Diesel and semi-Diesel engines are beyond the scope of the motor boat engine manufacturer with his existing plant, the small models would seem to represent an outlet for the activities of even automobile factories.

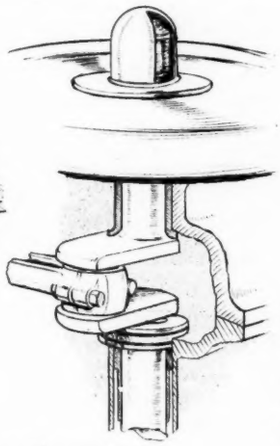
In point of fact, the crudities and excessive weight of the heavy oil engine appear to call for the influence of the automotive engineer. Weight reduction is, at present, considered unnecessary, if not actually undesirable; but when we find engines of less than 100 hp. weighing anything from 10,000 to 20,000 lb., and others of 6-10 hp. weighing 1000 to 1200, it seems time for fresh minds.

As a marine engine for certain large classes of use, the semi-Diesel has pronounced advantages over the heavy kerosene type. Its ability to use a cheaper fuel, its low costs of running and its efficiency at low rates of revolution make it eminently suitable in its smaller sizes for use in a sphere where it is rarely found at present, i.e., in heavy, slow-speed commercial small craft and as an auxiliary for sailing vessels. Although it is certainly coming more widely into use for such purposes, its excessive weight tells against it in a large number of cases. And here, it seems to the writer, the automotive engineer might well apply his experience and methods.

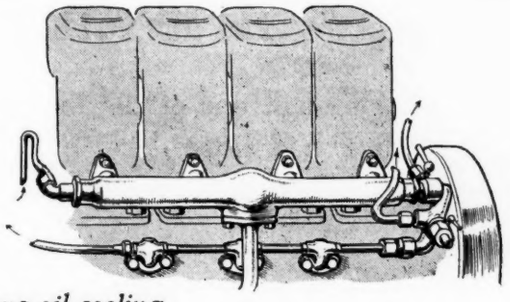
Exhibits Seen at the British Marine Engine Show



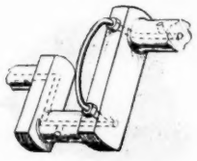
Watermota cylinder construction with copper jacket.

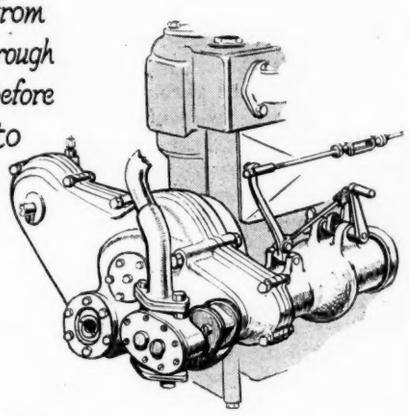


Ball thrust below crank of outboard type engine and oil lubricator above flywheel center.

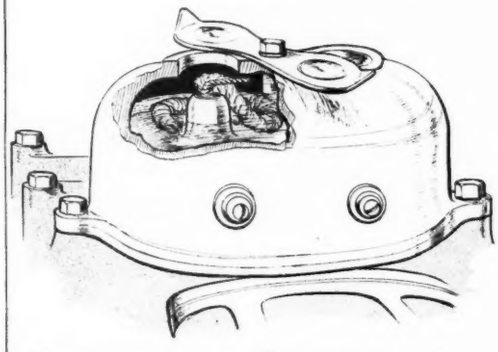


Parsons oil cooling system. Oil pipe from pump passes through water manifold before branching off to bearing leads.



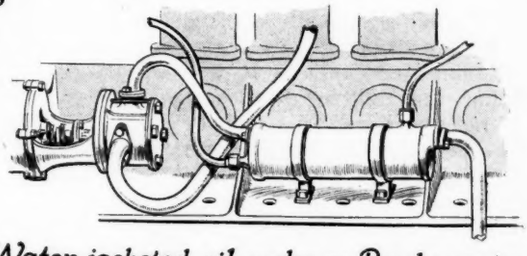


Jyfe Wilson light car engine, thermo-syphon cooling fitted with water pump and centrifugal type governor for river launch work.

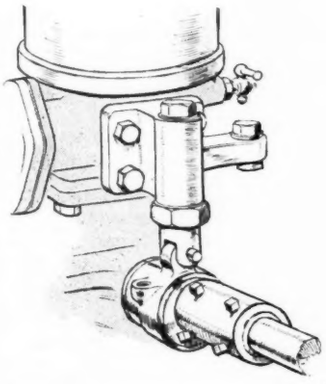


Aluminum cover, oil reservoir and support for valve rocker pins on 4 x 5½ in. Thorneycroft.

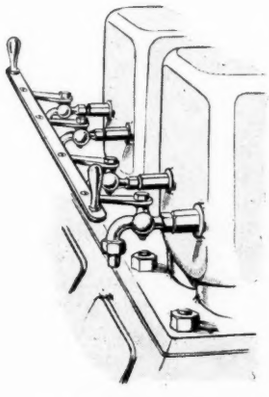
External oil pipes in place of drilled holes occur on two webs of Chapuis Dornier engine crankshaft.



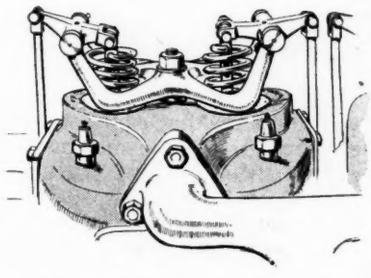
Water jacketed oil cooler on Brooke engine.



Eccentric water pump drive on rear end of crankshaft of Watermota inboard engine.



Coupled half-compression cocks at mid stroke on cylinders of Atlantic engine.



Double yoke holding inlet valve cages and supporting valve rockers on 70 h.p. Thorneycroft. Valve springs are hook-ended to pass through slots in valves.

Development of the Drag Link Results in Many Improvements

Although one of the important parts of the automotive vehicle, the drag link had little development until the past year. However, much was done with it in that time and much progress has been made in its design.

By V. A. Davisson*

DRAG links, like other parts of automotive vehicles, have been greatly improved during the past year. Although it has been recognized that the drag link is one of the most important parts, little attention has been given it until recently.

The first links were made by brazing the sockets to the connecting tube. These sockets (Fig. 1) caused considerable trouble, due to the fact that, after being in service a short time, the end plugs would strip and blow out, often causing an accident. To eliminate this a spring was placed in the socket to absorb vibration. Stripping of plugs stopped and the first step in drag link improvement had been accomplished.

Brazing is an expensive process and, with the advent of electric welding, one progressive company began a series of experiments, which resulted in a successfully welded link (Fig. 2). Engineers were at first skeptical and considerable missionary work was necessary before they could be convinced that a weld was as dependable as a brazed joint.

After the electrically welded link, the cap socket was developed for the heavier cars, as it was felt that the lightweight socket would not stand up. This style of socket, as shown in Fig. 3, was so successful that it has not been changed and is now used on many of the heavy cars as well as a number of trucks. The greatest advantage of the cap socket is that the ball cannot jump out of socket in case of spring or plug failure. Cap is held by a taper pin to prevent hammering of the threads.

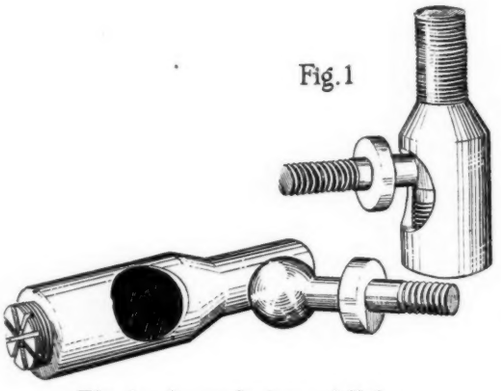


Fig. 1—An early type of link

From the development of the cap socket until 1919, no developments in drag link design or construction were made. It seems strange that while engine and chassis design as a whole was making rapid strides, this particular part of the steering mechanism received no attention. During the year 1919, however, the drag link has been developed more than in the many years preceding. Following are the improvements:

The grease self-lubricating link (Fig. 4).
The oil self-lubricating link (Fig. 5).
The end grease cup (Fig. 6).
Interchangeable parts:
The one-piece weldless link (Fig. 7).
The three-piece weldless link (Fig. 8).
The one-piece tractor link (Fig. 9).

*Associate member A. S. M. E. and S. A. E.

The self-lubricating link, as used on the Class B military and the heavy duty aviation trucks, as shown in Fig. 4, indicates only a slight change from the previous design. The ball seats toward the tube had a hole in them. When assembling, the tube and socket are filled with grease. During operation the play of the spring draws the grease from the tube and keeps the working surfaces well lubricated. In some cases the grease is replenished through a tapped hole in the tube or the bore of the socket. It has been found, however, that with the tube filled with lubricant when assembled, the working surfaces will be kept supplied for at least a year.

With the attention which has been given the question of oil lubrication, the drag link lubricating system was materially improved. As shown in Fig. 5, the ends of the connecting tube are closed by plugs through which a wick passes. The wick draws the lubricant directly to the working surfaces. By using one long piece of wicking, both sockets are oiled, even if the link is mounted in an inclined position and the oil is low.

The end grease cup, Fig. 6, delivers grease directly to the wearing surfaces. The grease storage space is larger than in the usual type of grease cup, which is screwed on the side of the link.

The dealer, as well as the manufacturer, is interested in reducing the number of service parts to be carried in stock. This end has been furthered by making the plugs and seats in both ends of a link interchangeable. This can readily be seen by comparing Figs. 2 and 7.

While the brazed and the welded links have given excellent service, a great deal of experimentation has been devoted to the development of a link which would eliminate the joint. Thus some links have the sockets screwed to the tubing, while some are screwed, pinned and brazed. Last year, however, there was developed a link made of a single piece of tubing (Fig. 7). The small connecting tube is expanded at the ends in such a manner that the cross-section of material is the same at all points. This is considered the greatest improvement in drag link construction as all parts of the link are of equal strength.

Fig. 8 shows a drag link adapted to light vehicles. The connecting rod is upset into the sockets at the end to eliminate the weld. The sockets, while held in place by spring pressure, are free to revolve slightly. This takes

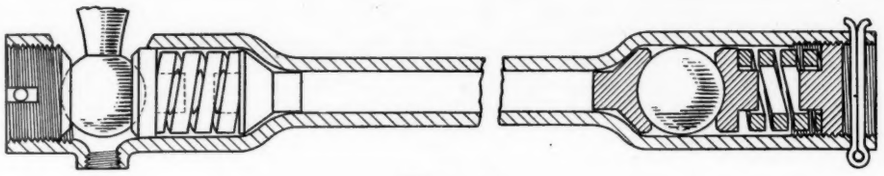


Fig. 2

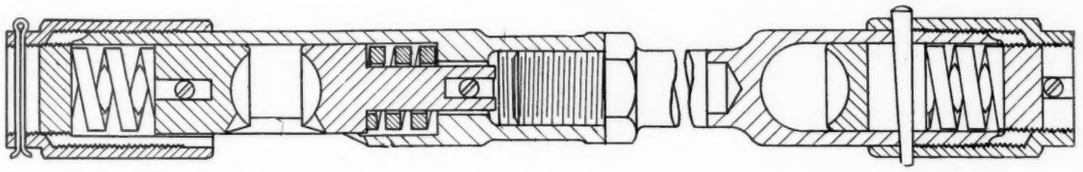


Fig. 3

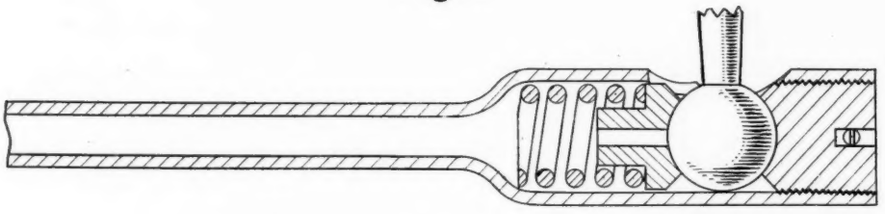


Fig. 4

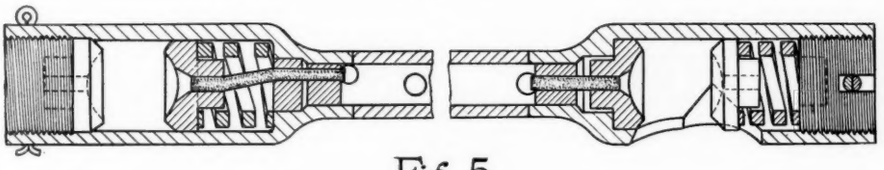


Fig. 5

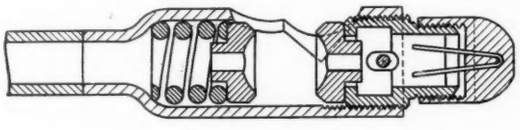


Fig. 6

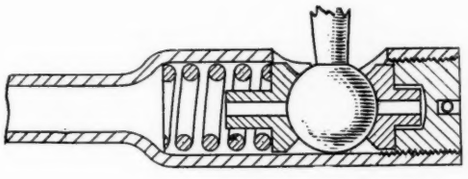


Fig. 7

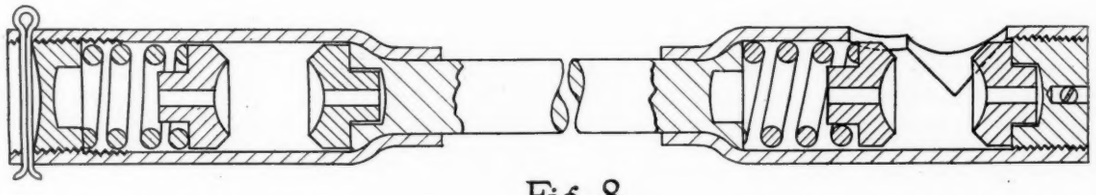


Fig. 8

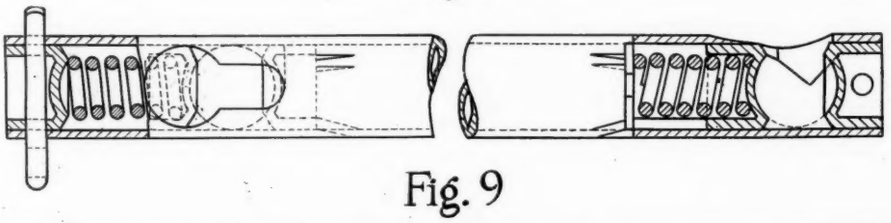


Fig. 9

Fig. 2—Welded link
Fig. 3—Capped link
Fig. 4—Grease lubricating link
Fig. 5—Oil lubricating link
Fig. 6—With end grease cup
Fig. 7—One-piece weldless
Fig. 8—Three-piece weldless
Fig. 9—One-piece tractor

care of the side motion of the steering arms which often injures the sides of the sockets.

Tractor manufacturers, in refining their designs to conform with automotive standards, are adopting the drag link type of steering. For this service a heavy yet inexpensive style of link, as shown in Fig. 9, has been used. While not as convenient as the standard style of drag link, the service rendered is the same.

In looking back over drag link development, it seems that the greatest progress has been made in the past year. This is true and from all indications we may expect few changes during the next few years. The break in production caused by the war gave car builders a chance to stop and perfect what had been considered an unimportant unit. The drag link came into its own for a time, for on its action the safety of the vehicle and its occupants depends.

However, with the return to large scale production it is probable that development on small parts will give way to intensive work on larger units.

Making the Square Hole Drilling Process Commercially Practical

A DEVICE that will drill a square hole in one operation in metal or other substances, without subsequent finishing and without previous preparation, is known as the "Radbore head." It is a drill based on the well-known principle of the Cardan circles and can be easily and rapidly attached to any milling machine or drill press. This is one of the multitude of products distributed by the Fairbanks Co., and is intended to provide a means for making square holes in gears or wherever square drilling can be advantageously employed. The illustrations will make clear the features of the design and mode of operation.

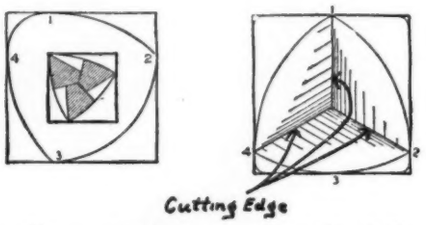


Fig. 1—Sections of square hole drill

In Fig. 1 the small numerals 1, 2, 3 and 4 indicate a cross-section of the shank of a drill that is rotated within a square guide, represented by the outer lines. The small square at the center represents the hole that is being drilled and the shaded portion is a cross-section of the cutting-edges. A clear idea of the motions of the drill may be had by tracing on thin paper an outline of the shank and cutting-edges in the left of the figure, and then turning the tracing around in such a way that the contour of the shank remains within the outer square or guide. If this is done, the cutting-edges or end of the drill will be seen to follow the outline of the square hole.

With cutting-edges ground as shown at the left of Fig. 1, the corners of the drilled hole will be slightly rounded or filleted. To make a hole having sharp corners, a shank as indicated at the right of Fig. 1 is used, with one cutting-edge longer than the others, in order to reach into the corners and square them. In both types, the cutters are so designed that there are no chips left at the bottom of the hole and no rough edges, so that blind holes can be drilled in one operation, without the necessity of subsequent finishing. The success of the operation depends upon the exactness with which the shank of the drill follows the square outline of the guide, and the dependability of the attachment rests upon its design in accordance with this principle.

The two styles of drills are known as type A and type B, the former making a hole with corners rounded, equal amounts of material being left in each of the four corners. This assures an equal distribution of the stresses in case the drilling is for the purpose of inserting a driveshaft. The type B drill is designed for die work, the squaring of the ends of keyways and similar operations. The type B drill is useful for the quick completion of sundry jobs, while the type A has the greater commercial value on production work in the factory.

"Radbore heads" or chucks are manufactured in four sizes and two styles, the range of the drills, $\frac{1}{8}$ to 2 in., being as nearly equally divided between the four chucks as possible. Type A drills are made from $\frac{1}{8}$ in. to 2 in., by sixteenths, and the type B by sixteenths, from $\frac{3}{8}$ in. to $1\frac{1}{4}$ in. As these drills are free cutting tools, with plenty of chip clearance, heavy pressure on the feed is not needed, and work is said to be done equally well in aluminum, cast iron and steel.

IT is said that the British Government motor transport depot at Slough is turning out motor cars and trucks at the rate of 175 per week, while 200 motorcycles are put on the road in the same time.

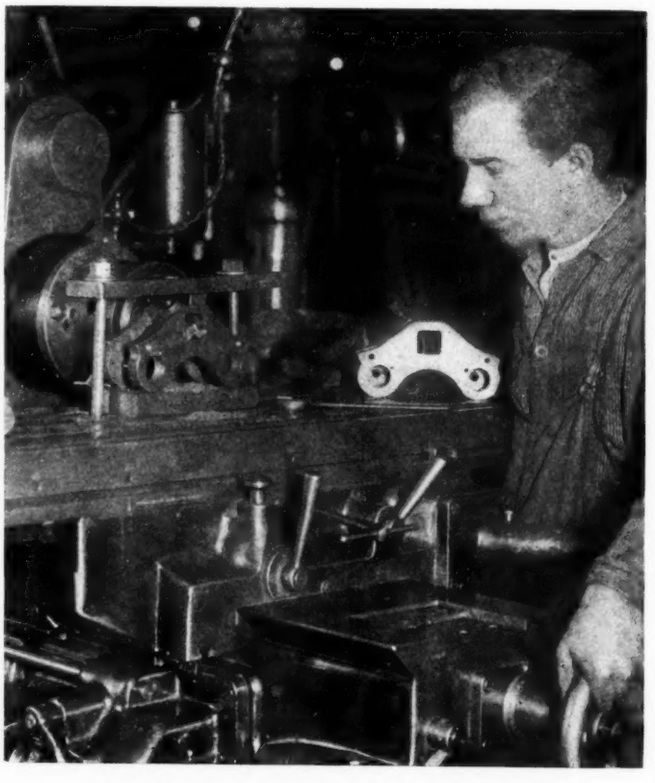


Fig. 2—The square hole drill in operation

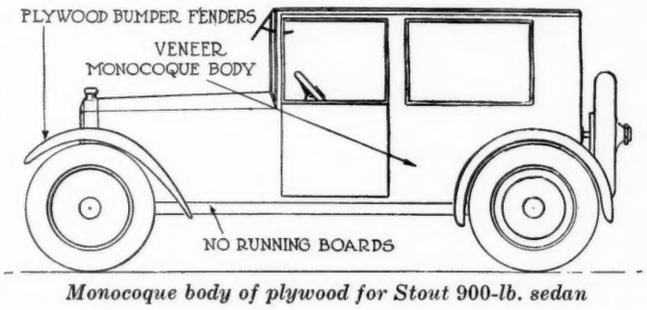
Plywood Body for Five-Passenger Sedan Weighs 120 Lb.

The extremely light car has long been a mooted point in the field of automotive design. Plywood, as developed out of airplane practice, has been considered as the body basis for such a machine. The article herewith tells of experiments with sedan and bus types.

EXPERIMENTAL plywood bodies are being constructed at the Stout Engineering Laboratories. At the present time, there is under development a special five-passenger sedan body which, it is claimed, will weigh only 120 lb. for a 112 in. wheelbase car. This is about one-third of the weight of an aluminum body of the same cubic capacity. There has just been shipped to one of the well known eastern manufacturers a five-passenger sedan body weighing 196 lb. This car, which is known for its lightness, has hitherto used an aluminum body weighing 600 lb. These bodies are constructed on airplane fuselage principles and are of a three-ply veneer combination, designed for unusual strength.

The characteristics of plywood have been discussed frequently in these columns and these allow the plywood to act as a sheathing and at the same time to add to the strength of the structure. The combination of veneers most commonly used consists of two plies of birch with a ply of mahogany between. The thickness averages about ⅛ in., although some of this material as used on airplane work is as thin as 1/32 in.

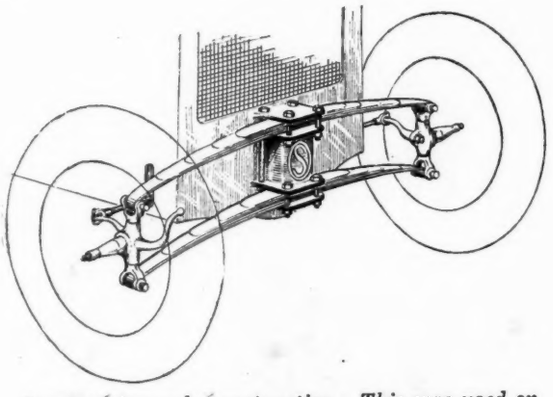
Designs are now being laid out for a two-deck automobile bus body enclosed both above and below. This body when completed, will weigh less than the present open types of bodies, according to the claims of the designers. Engineers who attended the last summer meeting of the Society of Automotive Engineers at Ottawa Beach will remember a rather interesting discussion on a 900 lb. five-passenger car. It is stated that a five-passenger sedan, to meet this weight, is under development at the Stout laboratories. It closely follows airplane fuselage practice, the particular construction being along the lines of the German Albatross. In that, the sills and frame are combined and the axles are replaced by cross-springs, which fulfill the functions of both springs and axle. The drive to the rear is through propeller shafts with universal joints. Plywood is used practically exclusively in the construction of the car, even the fenders being of this material. The cross-spring suspension is of particular interest, and is illustrated herewith.



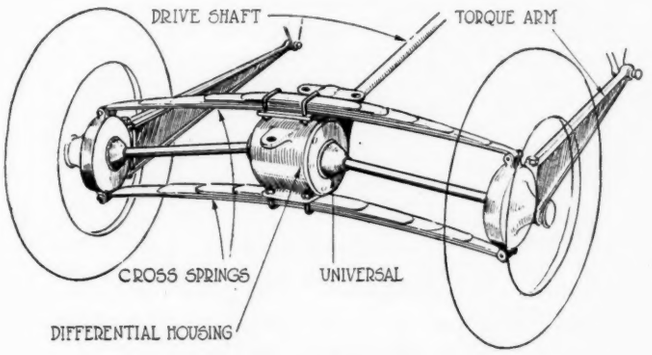
Monocoque body of plywood for Stout 900-lb. sedan

An Indian Source of Fuel Alcohol

IN the current number of "The Bulletin of the Imperial Institute," the possibility is discussed of utilizing the mowra flowers of India for the purpose of manufacturing alcohol for use as motor spirit. These flowers possess thick, juicy petals, rich in sugar. They are used by the natives as a foodstuff and especially for the preparation by fermentation of an alcoholic liquor called daru or mahwa spirit. A single tree will yield as much as 200-300 lb. of flowers in a year. About 90 gal. of 95 per cent alcohol are obtainable from one ton of the flowers. It has been estimated that in the Hyderabad State alone there are already sufficient mowra trees for the production of 700,000 gal. of proof spirit per annum. in addition to that necessary for the local liquor requirements.



Stout spring axle construction. This was used on a car manufactured by Mr. Stout in 1914



Sketch of spring rear axle construction for Stout light weight car

Tests of Lubricants for the Internal Combustion Engine

The detection of adulterants or other impurities in oils and the determination of their value should be of wide interest throughout the automotive field. In this, Mr. Ziesenheim describes various methods of tests.

By Fred C. Ziesenheim*

COMPLETE tests of a lubricating oil for use in internal-combustion engines will comprise laboratory tests of the oil's chemical and physical properties, special tests in an engine and extended operating tests with the engine performing its regular work.

Chemical tests are performed for detecting adulteration or lack of proper refining processes. Adulterants may be fixed oils of animal or vegetable origin, sulphonated oils, resins, or thickeners such as soaps or aluminum oleate. If the refining processes are poorly conducted, free sulphuric acid, free carbon, and tarry or asphaltic constituents may be present in the oil.

Acidity.—The oil must be neutral in acid and alkali reaction and must contain no naphthenic acids.

Emulsification and Moisture.—During the oil refining processes, oil is treated with sulphuric acid which is later washed out with water. An emulsification indicates the presence of free acids or sulpho compounds and is also an index as to the oil's chemical stability or resistance to heat decomposition. The effect of free acids upon bearings, exhaust valves and seats, is to cause rapid pitting and rusting, and consequent power losses. Oil must readily separate from water and not emulsify, as there is usually water present in the engine's lubricating system.

If a sample of oil with an equal quantity of water is heated to 180 deg. F., then vigorously shaken for five minutes and allowed to settle for one hour, the oil should show rapid separation from the water and the water should be only slightly turbid. Oils that permanently emulsify with water, rapidly decompose in service and those showing a poor emulsification test always suffer an undesirable decomposition when exposed to heat.

The oil should show no trace of moisture content. If a sample of oil, upon being heated gently, acts bumpy or froths, it is evident that water is present.

Insoluble Matter.—The presence of insoluble matter can be detected by making solutions of the oil in high grade solvents and then noting the precipitation after twelve hours. Matter insoluble in petroleum ether is hard asphalt. Matter insoluble in ether alcohol or high grade gasoline is soft asphalt, dirt and tarry constituents.

Physical Tests.—The physical tests are performed to determine the physical characteristics of the oil with the view of ascertaining the desirability of the oil for the particular purpose.

Color.—The color of an oil, although having nothing to do with its lubricating value, can be used to identify a sample. The color and appearance may indicate whether the oil is a compound with heavy cylinder stocks or is a straight run engine oil. The cleaner oil will usually deposit less carbon in the combustion chamber.

Odor.—The odor is neglible unless strongly repugnant, when the oil should be examined carefully for chemical adulterants and reactions, foreign materials from the barrels, and the like.

Gravity.—The Baumé gravity (Be¹) is obtained by immersing in the oil a hydrometer which has an arbitrary scale of values referred to the standard temperature of 60 deg. F. The specific gravity may be obtained from the relation—

$$\text{Specific Gravity} = \frac{140}{130 + \text{Be}^1\ \text{Gravity.}}$$

Gravity is no criterion of the lubricating value of an oil, but merely indicates the source of the crude—whether the oil is from a paraffine or an asphaltum base. An asphaltum base oil from Texas crude having a gravity of 20 Be¹, will have the same body and general lubricating properties as a paraffine base oil from Pennsylvania crude with a gravity of 30 Be¹.

Pour or Cold Test.—The cold test is the lowest temperature at which an oil will flow or pour. It has no reference to the oil's lubricating value except in relation to its desirability for low temperature conditions. Low or zero cold test oils are usually from asphatum base oils and will remain fluid at zero deg. F., whereas a paraffine base oil of similar lubricating properties will not pour below 40 deg. F. above zero.

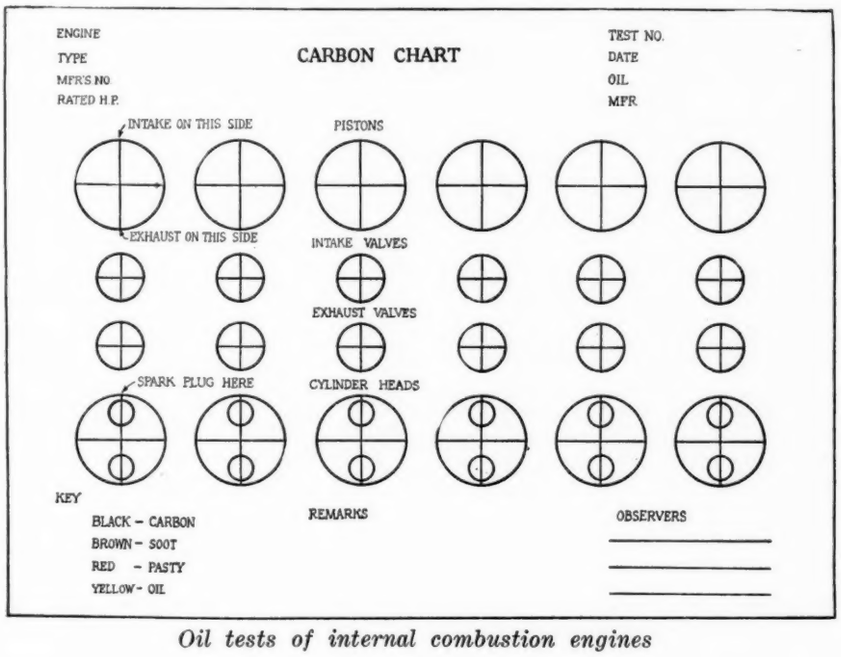
Flash.—The flash is that temperature at which an oil, upon being heated, emits sufficient vapor to cause a flash with the application of a small flame. The flash point is important only in that it indicates the volatility of the oil and the possible presence of kerosene and naphtha fractions with accompanying fire risks. Refined oils with the same lubricating characteristics but made from crude from different sources, have slightly different flash points. Considerable importance was formerly attached to the flash point of an oil for use in internal combustion engines, but flash is now considered secondary to the oil's ability to maintain the proper seal between the piston and cylinder wall, and the nature and extent of the carbon formation.

The oil film in the combustion chamber is in contact with the cylinder wall and is also exposed to the heat of the burning charge. The cylinder wall on its water jacket side, cannot be at a higher temperature than 212 deg. F., or boiling of the water would occur. The difference in temperature between the water jacket side and

*Mr. Ziesenheim is an engineer in the tractor experimental department of the International Harvester Co.

the combustion chamber side of the cylinder wall, will not be more than 30 to 50 deg. F., dependent upon the wall thickness and heat conductivity of the metal. The temperature of the oil film in contact with the cylinder wall, will therefore not exceed 250 to 300 deg. F. The maximum temperature of the burning charge will be about 2700 deg. F. for the explosive type and 2100 for the burning type of engine, but the burning type's high temperature is sustained over a longer period of time. The lowest temperature of the cylinder charge will be that of the intake air, which may approximate room temperature. The layer of oil on the metal is protected from the heat of the combustion by the low heat conductivity of the oil from its flame layer to its wall layer. The wall layer is also prevented from attaining high temperatures by the low temperature of the cylinder wall and the rapid heat conductivity of the metal. The oil is exposed to the high combustion temperatures only a short time before new oil is supplied by the wiping of the piston. It is evident, then, that it is unnecessary for the flash point of the oil to approximate the maximum temperature of the combustion chamber, but that a flash point of 300 deg. F. will be satisfactory for many classes of service.

Fire.—The fire point is the lowest temperature at which an oil, upon being heated, will emit sufficient vapor to support continuous combustion, with the application of a small flame. The fire point is usually from 35 to 65 deg. F. higher than the flash point, and indicates the lowest temperature at which continuous burning will take place.



Oil tests of internal combustion engines

Viscosity.—The viscosity of lubricating oil is one of the most important characteristics to be considered. The object of a lubricant is to prevent metal to metal contact of two sliding surfaces, with the minimum of internal friction within the lubricant itself. That characteristic of a lubricant which tends to keep the metal surfaces apart and to maintain a film, is considered body, and this body is indicated by the relative fluidity of the oil and is termed viscosity.

The viscosity of an oil is inversely proportional to its fluidity and is a measure of its internal friction and resistance to flow, and is a direct indication of the friction which will be developed in the bearing. The viscosity is determined by the measurement of the time taken by a certain quantity of oil to flow through a standard orifice at a certain temperature, and is expressed as seconds at a given temperature. The most commonly used instrument is the Saybolt Universal viscosimeter.

The viscosity of the oils should be known for the range of temperature to be encountered in service to insure the selection of an oil of the correct viscosity at the working temperature. Viscosity decreases rapidly with increased temperature, but this variation is different for oils from different crudes.

For use in internal combustion engines, the oil's viscosity should be known at 100, 130, 212, and 300 deg. F. Engineers are becoming more insistent on knowing the viscosities of their oils at the maximum temperatures to be encountered.

Carbon.—The total carbon residue left in a crucible from the continued heating and vaporization of an oil sample in accordance with the Conradson method should not exceed 1.5 per cent for practically all classes of internal combustion engine lubrication. The carbon should be loose, flaky, and easily removed from the crucible. The appearance and quantity of the carbon residue are a direct indication of the nature and extent of the carbon that will be deposited in the combustion chamber.

Ash.—If a sample of oil is burned in a platinum crucible, there should be no ash residue remaining after combustion.

Volatility.—Correct volatility is important if satisfactory economy and lubricating efficiency are to be obtained. The degree of volatility must be entirely determined by the maximum and mean temperatures to be encountered, and by the character of the load, whether constant or variable.

Heavy duty engine oils should contain the minimum quantity of low boiling point constituents consistent with low carbonization.

Evaporation.—The evaporation at a constant temperature over a considerable period of time, or a vacuum distillation, will indicate the evaporation loss that may be expected from the oil in service. Light motor oils will suffer an evaporation loss of as much as 15 to 25 per cent if heated at 300 deg. for 24 hr.

Oxidation.—The stability of an oil, its resistance to heat decomposition, is important not only because oil is exposed to high temperatures in the combustion chamber, but because the oil is being constantly splashed and thrown against the heated piston head. The degree of decomposition that occurs depends on the temperatures involved and upon the heat resisting properties of the oil, or its resistance to chemical decomposition into lighter hydrocarbons and nonlubricating portions consisting of solid or semi-solid hydrocarbons.

A laboratory duplication of engine conditions for ascertaining an oil's stability and its evaporation loss, is an oxidation oven. In an oxidation test, the oil sample is

kept at a uniform high temperature for a fixed period of time, the surface of the oil being swept by a continuous current of heated air. The ensuing evaporation may result from the loss of naturally volatile constituents, or from the cracking or fractionization of the oil by decomposition into volatile products and very heavy liquids or solid residues not soluble in petroleum ether. The most desirable oils are those having the correct volatility at the working temperature and those giving the least deposits of petroleum ether insolubles.

The viscosity, cold test, volatility, susceptibility to oxidation and emulsifying properties, are the most important tests from the engine lubrication standpoint.

Special Runs.—Engine tests of lubricants may consist of test runs for stated periods of time on a particular engine or engines, or may be extended operating runs with the engine delivering power for its intended work.

If comparative oil tests are to be performed on the same engine or similar engines, it is imperative that the conditions be as nearly identical as possible in the several runs. The initial condition of the engine should be the same in each run, the combustion chambers clean, valves tight with standard tappet clearances and timing, pistons and rings in first class condition, all engine bearings properly adjusted, and all the various engine parts in good condition and functioning properly. In assembling the engine preparatory to the test, the parts should be lubricated with the oil which is to be tested. The operating conditions of the test runs should be as nearly identical as possible with regard to temperatures of the ingoing water and air, manner of supplying the fuel and oil, manner of obtaining the test readings, and with the engine delivering its full or rated load. The fuel should be from the same source for all runs. If possible, sufficient fuel for the entire series of runs should be purchased and stored in the supply tank before commencing the tests. The sample of oil for the laboratory tests should be obtained from the oil supply tank just before the start of each run.

In conducting the tests, readings should be taken of time, revolutions, and torque for computing the horsepower, fuel and oil consumption, temperature of the cooling water in and out, temperature and barometric pressure of the air, control settings, etc.

Horsepower Computations.—The horsepower values may be referred to standard conditions of 760 millimeters barometric pressure and 15 deg. C. temperature, by a correction factor. Humidity is not considered.

Where—

$$\text{Horsepower corrected} = \text{Horsepower reading} \times \text{C}.$$

C = Correction factor

$$\text{C} = \frac{29.92}{\text{H}} \times \frac{459 + \text{T}}{459 + 59}$$

H = Barometric pressure, inches of mercury.

T = Air temperature, deg. F.

Function of a Lubricant.—One of the most important functions of an oil for internal combustion engines, is to maintain a seal between the piston and cylinder wall and prevent the fuel and products of combustion from escaping past the piston into the crankcase. Deterioration of the oil in use results primarily from the ineffectiveness of the piston seal and only to a small extent from the decomposition of the oil itself. If the oil is too light in body and is blown out by the combustion products, the piston will be burned by the escaping gases, and scoring of the piston and cylinder wall will result. If the oil allows portions of the fuel or combustion products to leak past the piston into the crankcase, it will result in contamination of the oil supply, with lowering of its gravity, flash, fire, and viscosity tests.

For comparisons of the used with the original oil, samples should be taken from the lubricating system at regular intervals during the run, as every half hour of a five hour test.

For some classes of engines, particularly large stationary or marine engines, the bearing temperatures are important. It is often possible to place thermometers on the main bearings and note the temperatures during the run, but upon completion of the test run, thermometers should be placed on all the bearings and other places where temperatures are considered important and readings taken rapidly until temperatures have reached the maximum and gone down again. The thermometers can be applied with putty, friction tape, packed with cotton waste, etc. The maximum bearing temperature for babbitt bearings in stationary practice is 160 deg. F.

In stopping the engine upon completion of the test, note whether it stops freely or labors and stops suddenly, whether preignition causes further running, and whether the engine appears to be hotter than usual, or normal.

Data Taken Upon Completion of Test Runs.—The examination of the engine upon completion of the test can be recorded as a written description and by photographs and charts. The thickness of the oil film on the cylinder walls can be measured by means of cigarette papers. Place a formed weight of one pound on a pack of Riz La Croix papers for five minutes and note the number of papers stained by the oil. Each paper is about 0.001 inch thick.

The extent of the carbon formation by weight, can be determined by weighing the parts when covered with carbon and when clean; the difference will be the carbon weight. An analysis of the carbon is often made to assist in determining its source, as in automobile engines for instance, an analysis will show that a large portion of the carbon formation is road dust or silica.

Final Condition Data.—For the final examination of its condition, the engine must be dismantled and the various parts examined in detail as outlined below:

Wearing Parts
- Oil Film
  - Sufficient
  - Insufficient
  - Odor
  - Color
  - Sediment
  - Grit
  - Body
- Wear
  - Normal
  - Abnormal
  - Free
  - Sticky
  - Smooth
  - Scored
- Heat Indication
  - Normal
  - Abnormal

Parts
- Cylinder bores
- Pistons
- Piston rings
- Piston pins
- Bearings
- Journals
- Valves
- Valve gear
- Cams
- Gears
- Auxiliaries

Combustion Parts
- Carbon Formation
- Nature
  - Hard
  - Soft
  - Brittle
  - Pasty
  - Sooty
  - Granular
  - Smooth
  - Clean
- Extent
  - Weight
  - Location
  - Charts
  - Photographs
- Heat Indication
  - Normal
  - Abnormal (red—preignition)
- Parts
  - Cylinders
  - Pistons
  - Valves
  - Spark plugs
  - Auxiliaries

Operating Runs.—Tests of lubricants on regular operating runs, with the engine delivering its power for its intended work, should follow the procedure given for the special comparative runs as closely as conditions permit.

That oil which satisfactorily and most economically lubricates the engine and leaves a minimum of carbonization products in the combustion chamber and which maintains its original condition for the longest time, is the oil best suited for the given conditions under which the tests have been run.

Economy in the Manufacture of Crankshafts

Specially designed lathes are recommended here as being the proper equipment for plants making more than twenty-five shafts daily. Two types of such machines are described here, with the operations of manufacture explained in detail, for capacities ranging to 100 daily.

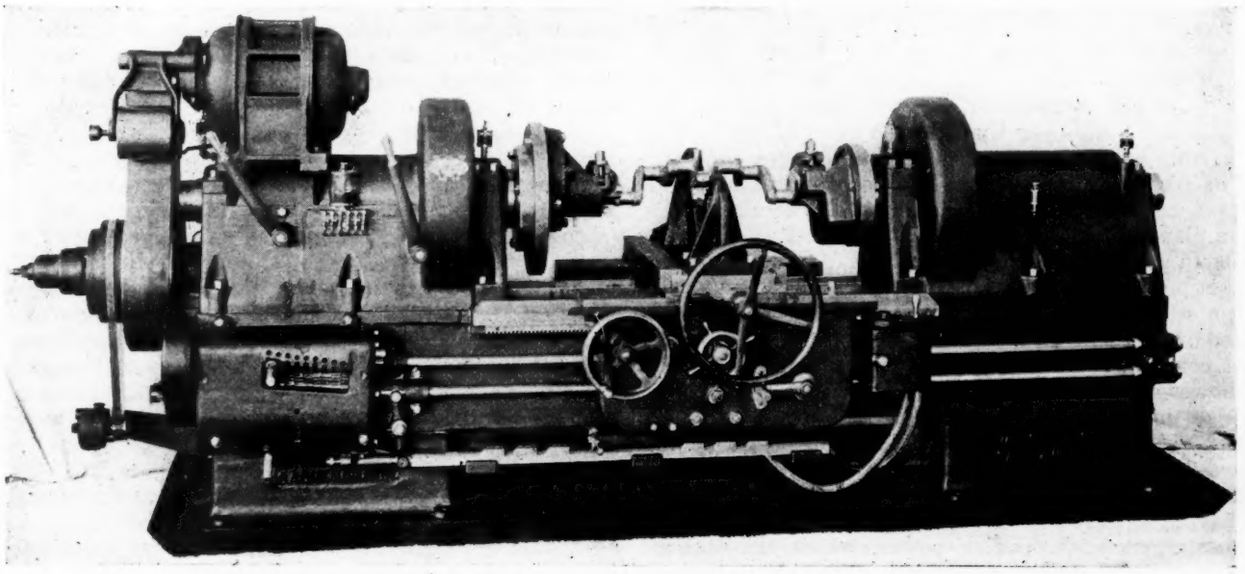
CRANKSHAFTS for automotive engines, when manufactured in quantities of 25 or more per day, should be made on specially designed lathes. Manufacture on the ordinary type of engine lathe in quantities above this generally works out to be poor economy, unless some special adaptations have been employed. With the increase in shaft diameters and with the closer limits of accuracy now in vogue, the special crankshaft lathe becomes even more of a necessity. Wickes Bros. have specialized on lathes for crankshaft manufacture and are producing two types, the Duplex, which is generally used for a production of 100 or more shafts per day, and the Universal, which has a capacity of from 50 to 80 six-throw shafts per day.

The Duplex is designed particularly for crankshafts with four or more throws and a separate machine is usually furnished for each pair of pins. For instance, on a six-throw crank, one crankshaft lathe would machine pins Nos. 1 and 6, another would machine Nos. 2 and 5, and a third would machine Nos. 3 and 4 pins, simultaneously. The usual practice is to deliver the cranks to the pin lathe, with the flange, front and rear journal and center bearing rough turned.

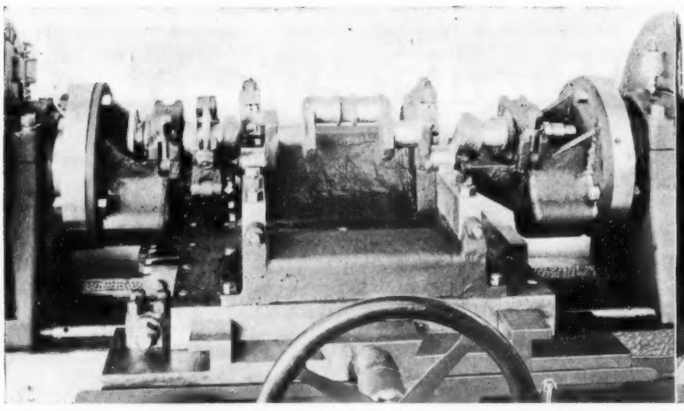
Cast steel pot chucks, mounted on the flanged end of the spindles of both headstocks, are used to clamp the crank in position for turning; the two front tools on the cross slide are then brought into action for turning the center portion of the pin. After this short operation is completed, the rear tools for turning the end portions of the pin and filleting are brought into action by a patented electric rapid cross-traverse mechanism. These two operations are completed in less than a minute, as the machining is done semi-automatically, the weight of the crank and its size, as handled by the operator, seems to be the basis of production rather than the actual machining time.

The initial drive, either direct from motor or countershaft, is by belt through a driving pulley. The drive is carried from the driving pulley through a friction clutch that is engaged or disengaged by the movement of one lever. Throwing the clutch out automatically engages a wide face band brake of automobile design and stops the spindle at a point most desirable to the operator for the removal of the finished shaft and the insertion of a rough shaft, ready to be machined. Two speed changes are obtained within the headstock by means of shifting gears, operated by one shifting lever.

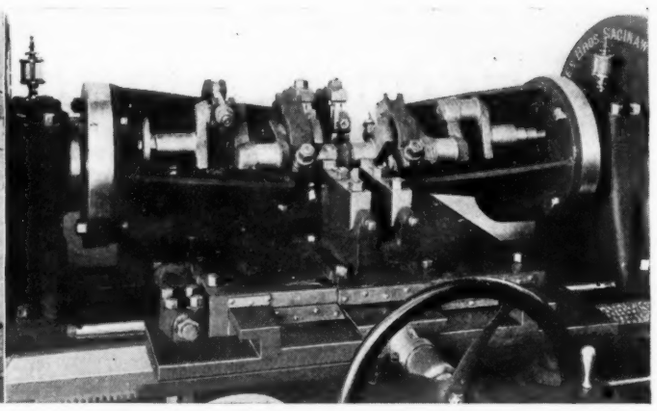
Both the front and rear headstocks are driven together by a heavy nickel steel shaft running through the center of the bed to a large diameter, wide face, herringbone gears. The herringbone pinions driving the face gear on the rear headstock, is adjustable on the driving shaft, for the purpose of alignment of pot chucks and taking up any lag which might accrue after long and hard service of the machine. The main spindles are made of high carbon crucible steel forgings with heavy, large diameter flanges for supporting the pot chucks or face plates, as the case



Wickes crankshaft turning lathe, showing horizontal turning tool in front with filleting tools in rear



Showing operations on pins 2 and 5 of six-throw crankshaft



Showing vertical wide nose tools in front for turning and filleting tools in rear for working on pins 3 and 4

may require. The position of the rear headstock on the bed can be changed to accommodate different lengths of shafts.

The lathe bed is heavy, with wide flanges, front and rear, having an extremely large section V in front for guiding the carriage and a standard V on the rear of the bed for alignment of the headstocks. Particularly wide surfaces are provided for gibbing the carriage, both front and rear, this being an essential feature in connection with crankshaft work wherein the front tools take a direct pressure downward and the rear tools a pull upward. This must be cared for by the strength of the bed proper.

The tool equipment consists of a set of Universal tool holders, mounted on heavy slides. The holders are arranged to receive and are provided with a set of two tool bit holders in front and two tool bit holders in the rear. The bits are used in these holders on the front of the lathe and are furnished with standard width tool bits, so that the operator may feed this tool across the face of the pin, or they are provided with wide nose vertical tools for taking practically the full width of the pin at one cut. The filleting tools in the rear (four in number, two on each holder) are the same for the standard tool as for the wide nose tool.

The Universal type is best suited to a nominal production of four- or six- throw cranks, or in cases where the customer is manufacturing a varied product for other concerns, for the reason that, while its production is not up to the Duplex lathe in quantity, it has the advantage in elasticity, to the extent of taking in any length of shaft permissible with the length of the bed furnished and of varied strokes from 1 in. to 3½ in. throw, or 7 in. stroke, and practically diameter and face of pin. The pot chucks furnished are adjustable for different throws and movable radially for different indexing of pins, the idea being that the crank is mounted in the two pot chucks and on the six-throw crank. Pins Nos. 1 and 6 are finished first, the machine is then stopped and indexed over to Nos. 2 and 5. These pins are machined, then the machine is reindexed to Nos. 3 and 4 pins and these pins are completed. In this way one machine completes an entire shaft in connection with the pin turning and filleting operations.

The Larger Airplane

COMING developments of the airplane will revolve around the triple factors of increased size and carrying capacity, greater speed and higher altitude range, in the opinion of Gianni Caproni, the Italian aviation engineer and constructor, who has made a short trip to the United States for the purpose of studying conditions in this country. Signor Caproni believes that the limits of size for airships have not been approached and that, as it has been with naval building, the coming years will see planes of greater and greater capacity.

While in New York he announced that he has started construction of a plane designed to carry 100 passengers. It has a wing spread of no more than 100 ft. but is equipped with eight 12-cylinder Liberty engines. Under present conditions, he plans it for low altitude cruising; later, however, he hopes to re-power the big ship in such a manner that it may operate at higher levels and with resultant higher speed. The 100-passenger plane, he said, was only a further development of a new Caproni triplane, photographs of which were recently received here, having a double-deck fuselage, seating 40 persons.

The enlargement of engine power, which the Italian designer predicted, will carry with it the development of super-charger mechanisms so that the ceiling may be pushed farther and farther upward. That phase he sees as one of the most forward efforts of aviation engineering. The higher levels will make possible greater speed, or lower engine consumption, and, naturally, enhance the safety of flight.

The future course of Italy, as regards aviation matters, will be that of increasing her air fleets in connection with the army and navy. The present military view in Italy is that another war would bring its first shock of combat in the air, rather than on the ground or on the seas. Consequently, Caproni stated that Italy would rely upon her aerial fighters rather than her fleet or her army and that this would necessitate a continued aviation section of large size. No governmental appropriations of unusual size have yet been made for the maintenance or creation of such a peace-time fleet, but the Italian said that his country might be expected to develop such a program within one or two years.

GERMANY continues to buy copper in the New York market, according to the *Wall Street Journal.* These purchases are of healthy proportions, and copper sellers deduce therefrom that future buying orders will cover large lots.

Selling the Farmer on the Use of Motor Trucks

The agricultural communities of the Middle West have gone through a land boom that has sky-rocketed values to unknown heights, necessitating enlarged and heavier production. The truck has a place on the farm to-day. This article tells something about the why and the wherefore of the motorization that present conditions make necessary.

A RECENT survey by a competent observer of motor truck conditions in one of the largest and most prosperous of the Middle Western agricultural states revealed the unexpected fact that only five makers were aggressively pushing the sales of such vehicles throughout the territory under consideration. Other designs were being sold here and there in gratifying numbers and sporadic attempts with various models had been made in numerous districts. But throughout the state, thinking of it from north to south and east to west, the report showed that only five companies could be characterized as having gone after the agricultural business with vigor and boldness.

Of the five, three were makers also of passenger cars and the presumption was that the truck sales of those companies went along hand in hand with the sale of their cars. The fourth company was the manufacturer of a complete line of farm equipment, the truck being only one of a number of products that were being marketed throughout the entire district. The fifth, and last of the aggressive merchandisers, sold only trucks—and its sales were becoming broader and broader, its agents and dealers spreading farther and farther in a campaign of efficient distribution and salesmanship.

The Year's Truck Production

"There is a widespread disinclination on the part of passenger car dealers to spend any time trying to sell trucks," the observer stated. "They say, generally, that it takes more time and effort to sell trucks than to sell passenger cars, and they are going to wait before investing in trucks and salesmen until the farmers actually are ready to buy and the trade is coming as easy as the passenger car trade is now. Some apparently high-class business men have no hesitation in saying that they gave up one line of trucks to take on another because the new connection agreed to help sell the trucks."

Truck production schedules for 1920 have been set at 400,000, with the probability expressed that at least 370,000 machines actually will be manufactured during the year, the smaller output being caused by labor shortage and the materials situation. This production would mean that 65,000 more machines must be disposed of in 1920 than were in 1919, the output for that year having been 305,000.

Three markets seem to be presented for the absorption of the 1920 machines. These comprise the export field and the double market of domestic consumption offered by the industrial growth of our cities and larger towns and the agricultural development of the farming districts and the smaller communities dependent upon the farm for their life. And these home markets seem to present problems of sales as distinct and separate as that of the foreign trade is from the domestic outlets.

Considering these potential fields, the export market, without discounting its possibilities or discrediting the importance of its cultivation, may be passed over for the purposes of this article with the statement that it absorbed no more than 15,500 trucks in 1919. Even with a greatly expanded volume in 1920, the foreign takings can be only a fraction of the total output.

The Domestic Market

Consequently, the greatest bulk of our trucks must be sold within the continental limits of the United States and must be absorbed by interests which are not new but which offer a measure of enlargement to correspond with the enlarged output. The industrial field already has been motorized to an extent overshadowing that of the farm. It has been the largest outlet for our truck production, its needs having been more apparent and more easily recognized; the farm, on the other hand, has been more in the background and less frequently considered. Now, with output mounting to new totals and expanding markets becoming more imperative, it seems that the agricultural districts should receive a greater measure of sales effort and that sales campaigns for the remainder of this year should focus a goodly part of their strength upon such markets.

Farm lands in the Middle West—in Iowa, Kansas, Missouri, Illinois, Nebraska, Ohio, Indiana, Michigan and numerous other states—have soared to unexpected values in the last twelve months, adding a twenty-five, fifty, one hundred per cent and even more to former prices. The land boom has been widespread and its effects will be marked upon agricultural methods and practices in those and other states. Farms doubled in value almost overnight, tenant rents have ascended in keeping with the ascending land price and costs of maintenance, such as interest on investment and on mortgages, necessarily have followed the ladder upward.

Ending the Boom

But the boom already has come largely to a stop in the sky-rocketing of values and the "ultimate owner," after the period of sales and resales, seems generally to have come into final possession of the land. He is the man who will be forced to work out the heavy cost and the heavy investment charges in terms of wheat and corn and dairy products and livestock. Most of the farms that have changed hands were purchased with the first payment due March 1 of this year—which may be assumed to have been

paid—while the remainder, or a large part of it, is not due for five years. Agricultural authorities have stated that many purchasers frequently bought with little more capital than was necessary for the first payments and for carrying them through until the next crop, hoping to earn from high productivity the next and succeeding payments.

Despite the increased value of agricultural products, advanced methods of farming, greater efficiency and improvements of marketing and distribution will be necessitated if these payments are to be met. It has been said that few farmers have increased production per acre more than a small per cent during the past thirty to fifty years and that the farmers' best profits in that time have come from the increase of his land value rather than from the products of his farming. Official statistics of the Department of Agriculture tend to bear out such statements, although some slight inaccuracies will be revealed in a study of the subject.

Acre Production Unchanged

With the corn crop, the yearly acre average from the close of the Civil War onward shows only slight changes from year to year and they could well be chargeable to the differences of the different years. The average acre production of corn during the ten years after the Civil War was 26.1 bushels; in 1918 the production was no more than 24 to the acre. In the intervening years, the product in 1915 had risen to 28.2, the highest of that period, and in 1913, the minimum year, had dropped as low as 23.1. The total production and its value, of course, had risen tremendously, but the average acre production kept at practically the same figures year after year. The increased use of fertilizers and better methods of farming have only offset the deterioration of the land from virgin quality.

Wheat production, in the same respect, has shown somewhat better. The average acre production immediately after the Civil War was 11.9 bushels; the 1918 crop showed a yield of 15.5, and the years seem to be marking a slow upward climb from the first figure, which was, after all, the minimum of the period. The maximum in 1915 had risen to 17 and, excepting 1916 when the yield was low, it has not fallen below 14.1 for some years. Total production and values have increased the same as corn, but the acre average has not risen sufficiently to consider that production methods of the individual farmer have changed greatly in the past years.

However, this article is concerned principally with the knowledge that farm land values have reached a high peak from which it is at least debatable whether the next few years will witness any further advances. The belief is growing widespread that the present values, after last year's upward rush, have become more or less stable and that the farmer now must take his future profits from production—a production that, although having a much greater worth, should and must be heavier and larger.

A Truck Maker's Problem

Land that was worth $200 an acre but now has sold for $400 or $450, as an instance, must increase its output and decrease the unit cost of production per acre, to meet the higher value. The increased sales price of the farm products will not suffice alone. Crops must be enlarged and cost units must be reduced or financial disaster certainly will result to the farmer.

This is an agricultural problem, primarily, but it also is one that has a concern for the maker of trucks, and likewise of tractors. If the farmer's market has been circumscribed and if his labor of delivery and of obtaining his supplies has been excessive, then the truck maker should aid him to cut away the loss by offering better and more up-to-date equipment so that he may range to larger and more distant markets, thus increasing his returns.

From the merchandising standpoint, the survey mentioned in the foregoing revealed some interesting facts. The most important was the revelation of the farmers' needs for such equipment, as shown by the great number of converted passenger cars and old trucks that were seen to be performing all kinds of duties in the country. Trailers of all sorts and descriptions largely made upon the farmer's own idea and perhaps on his own place out of an old buggy or a worn out passenger car, were witnessed in surprising numbers. Hitched to passenger cars, they were attempting work that should have fallen to the agricultural truck. Passenger car bodies had been changed in every fashion, just as the trailers had been built, and were performing yeoman service.

In many sections, large numbers of trucks had been sold and were more than giving good service. In other districts, farmers stated that little effort had been made to meet their demands. Their communities were without dealers or salesmen, they maintained, or they were unable to purchase machines or obtain equipment and service without long and probably expensive trips to the more distant cities.

"Several trucks formerly sold by dealers are not now handled by them," the report stated. "The change apparently was made because of sales and not for mechanical reasons. A dozen or more instances could be cited of dealers who now are handling no trucks or who have a different truck from that formerly sold. Apparently, many of the trucks scattered over the state in small numbers have been sold by the dealer with the help of the distributer when he first took the agency—and the dealer has sold few if any trucks since that initial venture. Often, it is reported, they have gotten rid of the second truck bought for stock at a low price to get it out of the way. Such instances, of course, are passenger car dealers.

Sales Campaigns

"Passenger car dealers are seldom interested in adding a truck line or in pushing the line they have. There are a few instances of successful truck selling by passenger car firms which do not departmentize their sales. The largest successes, however, are in cases where special men are put on truck sales.

"The prime need in sales campaigns is for information on the use of trucks on country roads. The motor car and truck dealer need this information—they can talk only vaguely of the utility of the farmer's machine. They have no instances of local uses, in many cases at least, to cite to the prospective customer. The dealers publish the advertising supplied by the manufacturer—on how efficient trucks are in distant states—and the farmer answers that the conditions are dissimilar.

"The wholesale grocery houses, as an instance of distributers, the poultry and egg dealers, the produce merchants, and the milk and cream collectors, all are in real need of information on how collection and distribution are handled. The best thing that the industry can do is to insist upon the collection of local data, with as complete figures as possible as to costs and results, to be used locally and throughout the state."

The work being done by the trucks already in use seems to follow out somewhat the already accepted ideas of benefit—principally those of enlarging the farmer's markets by increasing his sphere of selling and of reducing his hauling times and costs both to and from town. Marketing possibilities grow apace with the enlargement of the radius of transportation and instances were shown in which livestock was carried in trucks thirty and forty miles to stockyards and packing plants. In the dairying business, farmers too distant from the railroad or interurban to market

by horse-drawn vehicles were enabled to reach these sales points with little difficulty. And, perhaps unexpectedly, the use of trucks was not found to have cut into the business of the interurban lines; rather it was shown that the larger truck radius would enable the line to cut down its number of stations and consequently its cost and time of handling various shipments.

A growth was seen also in the facilities for local packing houses and slaughtering plants. During recent years, there was a lessening of such activities, due principally to the difficulty of obtaining sufficient stock. But, with the advent of the motor truck, a resumption of such plants was shown as it became more evident that supplies could be assured.

Of course, the tasks of carrying the farm products to the markets and the return of such loads as supplies, feed, etc., formed the larger part of the actual use by farmer-owners of their trucks. But this took sometimes unexpected turns. One was the movement of high-grade stock, particularly of breeding animals, from one farm to another, sometimes hundreds of miles. Another was the moving of hay and forage, and even water, to herds threatened because of drought or other emergencies. In the winter, when severe storms killed large numbers of cattle, trucks were utilized in speedily obtaining the hides, a service frequently impossible without such machines.

The state under survey was one in which the railroads were principally east to west lines, with few crossing from north to south. These trans-continental lines, of which there were several, sometimes were as far apart as fifty miles and communication between them was only by road. There, the trucks were performing unusual but extraordinarily necessary services.

A New Light Piston Alloy

DOW-METAL is a light alloy, manufactured by the Dow Chemical Co., which has been brought to the attention of automobile engineers within the past few months. It differs from other light alloys in that it contains over 90 per cent of magnesium, while the others are composed largely of aluminum and contain magnesium only in small amounts, if at all. The following facts concerning the development of the alloy and its properties were furnished by the company.

The production of magnesium was undertaken by the Dow company early in the war when foreign supplies, which had previously been obtained from Germany, were cut off. The company possesses a supply of raw material for the manufacture of magnesium in the brine pumped from its numerous wells and from which many chemical products are obtained. Among these products is the salt magnesium chloride, which is extracted from the brine, and after suitable preparation is used for the manufacture of metallic magnesium. The process employed is electrolytic, a heavy direct current being passed through a bath of the molten salt. The salt is decomposed by the current. Metallic magnesium is formed, which on account of its extreme lightness floats on the surface of the molten bath, and is skimmed off from time to time.

In the past the demand for magnesium was limited, owing to the fact that no alloys of it had been discovered which possessed the mechanical properties necessary for its use in engineering work. The demand was principally for use as a deoxidizer for non-ferrous metals, and for military purposes. Realizing the importance of discovering alloys combining the lightness of magnesium with mechanical strength, in order to create a wide market for its product, the Dow company undertook extensive investigations of the subject. A research department was established and of many alloys studied up to this time, a number have been found to possess desirable properties. Of the latter, one has been developed to the point where the manufacturers feel justified in recommending it to the automotive industry as a casting alloy, particularly adapted for use as a piston material. We understand that tests on Dow-metal pistons have been made in over forty engine manufacturing plants the past year, aside from the tests made by the Dow company itself.

The following table gives some of the more important physical constants of Dow-metal:

Specific gravity	1.79
Tensile strength	22,000-25,000 lb. per sq. in.
Yield point	12,000-14,000 lb. per sq. in.
Compressive strength	45,000 lb. per sq. in.
Elongation, 2 in.	3.5 per cent
Reduction in area	3.5 per cent
Modulus of elasticity	9,000,000
Brinell hardness	55.

With a specific gravity of only 1.79, Dow-metal has only one-fourth the weight of cast iron, while the common aluminum alloys are 50 per cent heavier.

Heat treatment increases the tensile strength of sand castings to 30,000 lb. per sq. in., without causing any appreciable change in yield point, while the elongation and reduction in area are increased to 6 per cent. Dow-metal can be forged with an increase in tensile strength to 50,000 lb. per sq. in., and a Brinell hardness of 70.

The heat productivity is 0.295, as compared with 1000 for pure copper and 0.108 for cast iron. The coefficient of linear expansion, over the range from zero to 800 deg. F. is 0.000028. This coefficient appears to be high for a material to be used in pistons. However, this expansion is not accompanied by any permanent growth, as in the case of aluminum alloys. In one test, a bar was subjected to 21 heatings of two hours each at 800 deg. F., and showed an increase in length of only 0.0003 inch per inch. In practice, pistons are fitted to the same clearances in the cylinder as are commonly given to aluminum pistons.

The machining qualities of Dow-metal are excellent. No cutting compound is used, while the machine may be run at high speed, without heating or dulling the tool. The metal takes a brilliant finish, without tearing. As compared with cast iron, only about one-third the time is required for machining.

The first test set of Dow-metal pistons was installed in a Ford engine more than a year ago. The car has been in constant service since that time.

Owing to the fact that in very powdered form magnesium burns readily when ignited, and hence has found a use in flashlight powders and for military purposes, it is sometimes questioned whether it can be used for other purposes. As a matter of fact, aluminum is equally inflammable when finely powdered, and finds extensive use on that account, as in the thermite process. In solid form magnesium is not inflammable.

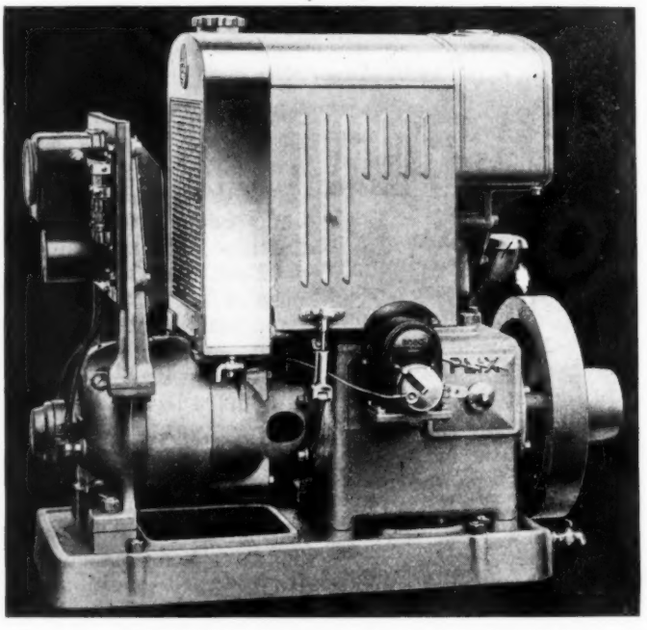
The Dow company regularly recovers all its shavings, which can be melted up and recast.

Designing a Lighting Plant for the Export Field

Sales problems in the foreign market frequently demand different solutions from those of domestic origin. The description herewith shows briefly how one firm has reconstructed its lighting plant for such sales.

IN a recent attempt to construct a lighting plant that would be particularly suited for the export field, the designers found themselves faced with the two-fold problem of overcoming the sales resistance to American products and of constructing a unit that would occupy the least amount of shipping space. The sales resistance, which is also encountered with many other products manufactured in this country, seemed largely due to a desire on the purchaser's part for a machine presenting a more compact and attractive appearance. European practice in many lines, it was found, is to seek a finished appearance, more pleasing to the eye. In addition, it was necessary to keep up the standard of quality.

With these demands as a basis, the plant, which has been marketed under the name of Plix, was designed so as to closely resemble an automobile, with a honeycomb radiator, extended tank, and hood sides. The power and generating unit has much of the appearance of a motor car bonnet, and demonstrators and salesmen are instructed to state that the plant can be operated the same as the automobile and with no more difficulty. Such a sales point has been found valuable in approaching a prospect who owns or has operated a car.



Magneto side of the Plix lighting plant, showing the automobile construction

The change of design was accomplished principally by changing the cooling system. In the original plant a large cylindrical water tank was carried upon the rear of the base, the system, of course, being of the simplest nature. This was altered so that a honeycomb brass radiator, with an extension tank, was fitted above and in front of the single cylinder engine. The cooling is assisted by a four-blade fan, as in automobile practice, situated directly back of the radiator, and the whole, including the engine, is enclosed by enameled sides dropping down from the tank and conforming to the shape of the radiator. The fuel tank is placed directly in the rear of the water tank and is, of course, in keeping with the general style of construction.

Another departure from domestic practice is the installation of a Bosch magneto instead of the usual timer and coil. Foreign demand was interpreted as wishing such a system, although the cost of construction has been increased thereby. The magneto is driven direct from the camshaft.

The engine is four cycle, single cylinder, 3 x 3 in., having a rating of 3.6 hp. at 1250 r.p.m. The camshaft is located at right angles to and above the crankshaft and the valve mechanism, including camshaft, bearings, gear and tappets, is mounted on a bearing plate so that it may be removed as a unit. Lubrication is by splash, and the cooling system—since the plant is for export—was planned not only for the hottest but for the coldest climates. The plant is started by pushing a starter button on the switchboard, extensions of which are possible to other places.

The generator is a unit with the engine, wound for 32-37 volts, and is of General Electric construction. It is driven by the crankshaft direct. The generator unit, which includes the engine and switchboard, is on a metal base, with a power pulley secured to the flywheel.

A Willard 16-cell battery, rated at 80 ampere-hours on an 8-hr. discharge rate basis, is furnished with the plant. The plant is sold as of 65 light capacity and the engine is designed to run on either gasoline or kerosene.

Advantages of Special Steels

IN his presidential address to the Institute of Engineers and Shipbuilders in Scotland, Dr. T. Blackwood Murray pointed out, as an example of the advantage of using special steels, the fact that the weight of a motor car gear is less than 12 per cent of the weight of an electric crane reduction gear transmitting a similar load at similar speeds. He also dealt with the increasingly important part played by aluminum alloys in the construction of motor vehicles and aircraft, and said that a new light piston alloy, the chief constituent of which is magnesium, with a specific gravity of 1.74, had appeared in America.

Heat-Treated Axle Tubing

Editor AUTOMOTIVE INDUSTRIES:

IN the April 1 issue of your magazine I note in an article entitled "Government Test of New Heating Furnaces" a statement in the last paragraph, "up to the present time no axle tubing has been produced in quantities which will meet the requirements of Specification 10,229, calling for 200,000 lb. tensile strength with 5 per cent elongation in 2 in."

I would like to call your attention to the fact that during the war this company offered the United States Government the use of the electrical heat treating process which we had developed and which would produce in steel tubing of the analysis specified for aircraft axles a product more than meeting the government specifications. In this connection, we heat treated some axles for the Dayton-Wright Airplane Co. and their report to us on their own test gave the following results:

Elastic limit, 198,600 lb.
Ultimate strength, 223,500 lb.
Elongation in 2 in., 6.0 per cent.

The second test on tubing drawn back to a lower temperature gave an

Elastic limit, 220,500 lb.
Ultimate strength, 246,000 lb.
Elongation in 2 in., 6.5 per cent.

This process was available at the beginning of the war and all through it, and the necessary capacity for heat treating the axles of all aircraft produced by this country could have been developed in two months time; it is now in daily use in our plant. During the war we furnished a large number of heat treated tubular axles and other landing chassis members to the Standard Air Craft Corp. for use on Handley-Page machines. After the termination of our work with them, they wrote us saying, "We wish to take this opportunity of expressing to you our appreciation of the careful way you handled the entire matter, particularly in reference to the heat treatment of the tubing, The writer has been familiar more or less with the heat treating process in vogue during the past ten years, and from tests made on the tubing heat treated by you at your plant, we believe the process you used and the results obtained are far superior to anything we have ever seen."

SNEAD & COMPANY,
Vice-President, H. P. MacDonald.

British Tractor Trials

Editor AUTOMOTIVE INDUSTRIES:

AN arrangement has been made whereby the Society of Motor Manufacturers and Trades, Ltd., and the R. A. S. will unite during 1920 for holding a tractor trial, to the end that the waste of time, money and effort which would inevitably be entailed in the event of two trials being organized in one year will be eliminated. As an exhibition, there can be no doubt whatever that it will be considerably strengthened and its value enhanced by the union of these two powerful bodies. In the event of the interest being divided, neither trial would have had that advantage. Some makers would have clung to the S. M. M. & T. and others to the Royal, for each society, besides having its own special call for preference, also has its own strict adherents. One of the principal benefits of such a trial to the farmer—the opportunity of seeing all or any machine at work and making comparisons on the spot between the actual performances under similar conditions—would thereby have been lost. As things are, the trial will be a fully representative one.

From certain statements which have appeared in the press, it is evident that some misapprehension exists as to the real circumstances which have determined this course. It may be useful, therefore, to examine the events which led to this decision.

It was the intention of the S. M. M. & T. from the commencement to make their trial an annual affair, in the same fashion as they have adopted in connection with motor cars at Olympia.

When it became evident that the R. A. S. intended to hold a trial during 1920, the S. M. M. & T. as manufacturers found themselves faced with the possibility of having to stand the expense of attending two trials in one year. Steps were immediately taken to ascertain the opinion of tractor manufacturers generally as to the advisability of limiting the number of such exhibitions and the consensus of opinion was strongly in favor of there being one representative event each year.

The S. M. M. & T. then approached the R. A. S. with a view to ascertaining whether it was feasible to join forces, and, after some little discussion, it became apparent that there was really, apart from the question of making the trial competitive, no difference of opinion between the two bodies. The R. A. S. invited the S. M. M. & T. to nominate a committee of five who would confer with an equal number of members of the Implements Committee of the R. A. S. in making arrangements for the trial.

H. SCOTT HALL,
Tractor Trial Organizer, S. M. M. & T.

Axle and Hub Standardization

April 15, 1920.

Editor AUTOMOTIVE INDUSTRIES:

I HAVE read with a great deal of interest Mr. Schipper's article in AUTOMOTIVE INDUSTRIES of April 1 on axle and hub design. The matter is very well presented, indeed, and I think you make a very courageous fight for simplification of design without placing the matter in an offensive light to manufacturers of complicated types of articles.

Undoubtedly the article will accomplish a great deal of good in compelling thought along the lines you suggested. It is undoubtedly the purpose to reduce practically the number of sizes to at least nine for all passenger car equipment, no matter what type of axle is used. If the simple type of live axle is used this number of sizes could be reduced to five to accommodate all sizes and weights of cars in the passenger car field.

DETROIT PRESSED STEEL COMPANY.
A. L. Putnam, General Manager
Disteel Wheel Division.

The Course of Labor and the Workers' Tendency in Great Britain

This is the second of two articles on English labor by Mr. Northcott, the first having been published in the issue of March 4. In this, he takes up the problems involved in obtaining high production. Its interest to American manufacturers is that it indicates what might be expected if workers in the United States followed the lead of their Anglo-Saxon brothers.

By Clarence H. Northcott

WHAT is the attitude of labor in Great Britain toward increased production? The answer to this question may decide the industrial future of the country. For labor holds the key to output and production and, thereby, to trade, commerce and industry. Great Britain has suffered a great loss through the war in respect to her producing power, her trade, her shipping and her financial strength. Seven millions out of about nine millions of her men of military age were called into the army or navy. For three or four years this great body of producers was withdrawn from her factories. Eight hundred thousand of them lie dead on the field of victory, while large numbers of them never again will "pull their weight" in the industrial struggle. Great Britain hazarded her financial and maritime supremacy also in the fight for victory, and emerged at the armistice with a heavy leeway to make up.

The country's reduced man-power and the vital necessity for rebuilding her economic future have given labor a strategic position, of which it has not been slow to avail itself. How it has obtained shorter hours, higher wages, stronger and numerically more powerful organization is not the story of this article. What is important to notice is that organized labor can hold up production. At the close of 1918, the membership of the registered trade unions had reached 6,620,000, an increase over 1914 of more than 57 per cent. It is probable that the trade unionists of Great Britain now number 7,500,000, which constitutes a very large proportion of the manual laborers of the country.

With such strength, the attitude of labor toward output is of vital moment. Let it be said frankly that there are labor leaders who have been fearless and outspoken on the subject. The railway stations of the country are placarded with statements from J. H. Thomas, M.P., of the National Union of Railwaymen; William Brace, M.P., of the South Wales Miners; J. H. Clynes, lately the Food Controller, and John Hodge, of the Iron and Steel Smelters. All emphasize the absolute necessity of increased production. J. T. Brownlie, chairman of the executive council of the Amalgamated Society of Engineers, brought the need for increased production before the Trade Union Congress last September and has since dealt pointedly with what he calls the imperative necessity "that the essentials of life should be produced in abundance, thus lowering prices." Everywhere, almost, among the moderate-minded and responsible leaders of labor, one finds a wise grasp of the economic importance and necessity of increased production and an insistence on it in the interests of the whole of mankind.

But in general, labor is little interested in increased production. Whatever the labor leaders may think or suggest has not penetrated the consciousness of the rank and file. The latter have a conventional standard of living as measured by the pay envelope; they do not see either a use or necessity of continued toil. The miners are notorious for their readiness to stay away from work when they have earned their usual wages. Their action may make coal dear to their fellow Britishers and cause Frenchmen and Italians to shiver through a dreary winter, but that does not concern them. If they worked harder and longer, they would earn more and thereby come under the provisions of the income tax. Their objection to the income tax is well known. Nor is this objection confined to the miners. Authentic cases in various industries have been cited to me in which men have deliberately cut their earnings, alleging in explanation that they were not going to earn money to be paid to the government in taxes. So, too, I have been given authentic cases of tailors who are earning wages so much beyond anything they had previously earned that they insist on two days' rest per week, not returning to work on Monday.

A systematic investigation of the metal trades of Great Britain has recently been made by *The Times*. An amazing revelation was given of the forces adverse to production that are to be found at work in practically every industry in the country. Much of the strength of these forces is centered in that preference for day work rather than piecework, which is one of the distinguishing characteristics of the British workman. Yet this very characteristic is crossed by an adhesion to local customs that will cause piecework to be accepted in one part of the country, while resisted in another. While there is a strong feeling among the metal trades against the piecework system and, of course, any allied forms of premium bonus, a significant minority of the workers in the metal trades favor piecework with its incentive to increased production. Thus, of the firms replying to the above-mentioned investigation, 30 per cent stated that they had met with no appreciable hindrances to production.

It should be made clear at the outset that the iron and steel workers and those engaged on blast furnaces have a deeply-rooted preference for piecework. They are a highly organized group of skilled men. They work in a team or gang, each one contributing equally to production and each liable to be called upon for extra effort to meet an emergency. For reasons difficult to

summarize in their totality, they have had a history almost devoid of strikes. Their wages are regulated by national and district agreements providing for conciliation boards, which have drawn up intricate wage scales. Under these circumstances, no opposition to full production or to any system of payment by results is to be found.

Among the illustrations cited in the above investigation were three works making motor chassis. These have a system of payment by results, which met with practically no opposition. A Lancashire firm of general manufacturing engineers and a Scottish firm of hydraulic and constructional engineers reported a similar experience. One large Midlands firm manufacturing wagons and another making cranes found their men almost solid in their defence of the piecework and bonus systems under which they were paid for all they produce. In the shipyards, both on Tyneside and in Ireland, there was a considerable body of believers in piecework, although this was not always a guarantee that the fullest productivity would be given. An agreed output, measured by a certain weekly total of earnings, may mean a considerable restriction of production. Wherever normal effort is given on piecework, the earnings of workers are found to display all that diversity that arises from differences of skill, strength, temperament and economic need. Where uniform earnings are found, therefore, one may reasonably conclude that restriction is present. Such a result was found in the experience of an engineering establishment in the Midlands where 8000 hands were employed. Here men on the same job turned out almost identical quantities, thus demonstrating the presence of an organized and irrational restriction. In contrast to this it is interesting to observe that the Priestman bonus scheme, whereby an attempt was made to organize and reward increased output, received the formal endorsement of the trade unions concerned.

Production Diminution

Diminution in production follows upon the transition from piecework to daywork. In the middle of the war the Amalgamated Society of Engineers made a determined effort to abolish piecework, and succeeded in a large percentage of cases. A large machine engineering works estimated that this action resulted in a decrease in production to them of 50 per cent and more. In the case of a large engineering firm in Ireland, the workers were compelled by the A. S. E. to go on to daywork against their will and that of the management, with an immediate drop in output of 20 per cent. Just what piecework means for increased production, so far as the workers themselves are prepared to measure the increase, is suggested by a clause found in agreements in trades where piecework is in vogue. In these cases piecework rates must guarantee a pieceworker of average ability a wage higher than that of a dayworker by from 25 to 33 per cent. This provision is advocated and defended on the ground that a pieceworker produces that proportion more than a dayworker. If this contention of a large number of unions be correct, then the refusal of such workers as those in the building and metal trades to work at piece or premium bonus rates is thereby condemnable as a refusal to give the full measure of production.

Restriction of production results also where workers seek to cut out the third shift, in a three-shift day, or refuse to work overtime. During the year 1919, the Amalgamated Society of Engineers refused to work overtime, with the result that new production schemes were delayed or thrown aside. The shipbuilding of South Wales, the automobile manufacturing of Coventry and the general metal trades of Birmingham all reported this as a factor in their inability to deliver goods on time. The coal ports of Wales also reported a serious curtailment in the export of coal because tippers and trimmers had refused to work a third shift per day and had reduced Saturday work to one shift.

The reduction in hours of labor has been quite a significant factor in connection with output. Since the armistice Great Britain has experienced a most remarkable reduction in the hours of labor. During 1919 this reduction was greater than the cumulative effects of a quarter of a century's action prior to the war. In one single year British industry suffered a widespread and far-reaching diminution in the opportunities for production. At the end of 1918, the average hours in industry ranged from 48 in progressive establishments to 60 in others. At the close of 1919 the former establishments had reduced to 44 hours, while few industries could be found which worked more than 48 hours. Altogether 6,400,000 workers had received an average reduction of 6½ hours per week per head. The cotton industry had reduced from 55½ to 48 hours; the metal trades from 54 to 47; printing trades, which formerly worked 51 hours, now work 48 hours. In the transport trades, the average reduction per head for the workpeople affected was nine hours per week.

This reduction in hours has always been accompanied by reduction in output. In one industry where the reduction in hours reached 15 per cent, it was pointed out by the workers' leaders that this reduction need not mean correspondingly decreased production, and they confidently anticipated that the decrease would not be more than 7 per cent. Results proved that the decrease in production almost equalled the decrease in hours. There is no industry in Great Britain where reduced hours have led to increased output by diminution of fatigue or by any direct result attributable to reduction of hours as a prime cause.

The coal miners, now working seven hours a day, are realizing almost the same total weekly output as on the eight-hour day, but only as the result of an increase in labor power. In South Wales the number of persons employed underground increased during 1919 from about 190,000 to about 215,000, but the output declined from about 23½ tons per person to 17½ tons. On the railways the 8-hour day is responsible for much congestion which, in its turn, is seriously affecting production and the revival of industry. In the shipping centers delays in loading, discharging and bunkering have resulted from the reduced hours and the general carelessness of labor concerning output and effort, so that shipping is losing an amount of time estimated at 30 per cent.

The reduction in hours of labor has been accompanied by what could, without exaggeration, be described as a wage revolution. Wages have risen to a height and to a degree never dreamed of by Great Britain in the prewar days. In every case of reduction of hours, there was a condition that weekly time wages should be adjusted so that workers would not lose financially by the changes in hours. This was equivalent to the same wage for shorter hours. When these shorter hours were accompanied by reduced output, it was obvious that higher wages had come to mean not only reduced output, but higher cost of production per unit. But wages did not remain at the same level during 1919. As hours were reduced, by trade union pressure, so wages were increased even more.

This advance in wages dates back to 1917. In 1918,

about six million workers received an average advance of ten shillings per week. In 1919, more than five and a half million workers received an aggregate increase of over £2,100,000. Wages have now reached a figure that could never have been imagined before the war, and most competent observers estimate that they will remain somewhere near these figures for some years to come. While these wages are not in themselves subjects for concern, they will readily become heavy burdens upon industry if they are accompanied by any organized system of restriction.

In this economic platitude lies the whole significance of the attitude of labor toward production. But its organized strength labor has forced up wages and reduced hours. If it is using its organized strength to reduce production at the same time, it is blazing a trail to national bankruptcy and poverty. It may not realize what will be the effect of its actions, a fact which makes the situation the more tragic.

It is, therefore, a matter of some concern that employers in the investigation made by *The Times* debit to trade unions' action much of the opposition to full production there discussed. In the case quoted from the Midlands, where a uniform production was found among pieceworkers, concerted trade action was obvious. The refusal to work overtime or a third shift was an open and overt act of the A. S. E. The motives prompting these acts are obvious but do not excuse their stupidity. The A. S. E. was seeking to reduce unemployment among its members. They have not learned that production breeds production. The workers in the Midlands factory were seeking either to avoid forcing the pace for the slowest men or to get a better piece rate for new jobs.

Blind and Stupid Measures

Behind this restriction and the blind and stupid methods by which it is enforced are two motives that must be given due weight. These are instances of the fear that dogs the step of the workman in competitive industries. One of these types of fear is common to the United States; the other is avoided there by a wiser wage policy. The first is the fear of unemployment. Men argue that production at full capacity will only result in working themselves out of a job. Their experience in the past has shown that periods of feverish industrial activity have been followed by cycles of severe unemployment. They have not the knowledge or economic vision to appreciate the starvation, both physical and industrial, besetting the world to-day and constituting both the challenge and the necessity for increased production. They act and argue like men afraid to venture on to new paths.

An illustration of peculiar interest in this connection is afforded by the offer made by a large manufacturing firm to certain builders in its employ. This firm, like many in Great Britain to-day, was engaged in building a model village some distance away from the city boundaries. During the bad weather of November and December the workmen on these houses suffered much broken time and came to ask whether the firm could not offer them the benefits of an unemployment fund such as its employees in its own factory had. The firm replied that it would be willing to do so if the men themselves would contribute to it. Further they would give a large number of other benefits if the men would "put their backs" into the building of the houses so urgently needed for their fellow workers. One of the proposals made required the endorsement of their trade union, without which it was impracticable. The men had hitherto walked from the city boundary to the village, for which they were allowed half an hour and, following trade union regulations, were paid for that time.

The firm proposed that the men should report on their work at the hour at which they had previously left the city boundary. This would mean that they would have an extra half hour within the limits of the agreed working hours of the winter day for actual work on the building. The firm proposed to pay them overtime for this half hour at the rate of time and a half, suggesting that the extra "half" time should be the men's contribution to the unemployment fund, which they themselves would double. The union representatives, despite the fact that the men wished to make the arrangement in order to get an unemployment fund and despite the saving in time and cost in the erection of workmen's houses, declined to sanction the arrangement on the ground that their rules forbade overtime. In reality, the fear that they would build the houses more rapidly than normal and would thus work themselves too quickly out of a job was the motive prompting such a decision on the part of the union.

Fear Wage Cuts

The second fear which besets the British worker and leads him to "soldier" on the job is that his high earnings will be followed by a cut in piece rates. To American employers and workers alike, this will appear irrational. Unfortunately for the credit of British employers, there is too much ground for such fear. British employers in the past have unwisely held to a conventional wage, beyond which they thought a workman should not be allowed to earn. They had no clear notion of the economy of high wages. They did not measure their business success so much by reduction in costs and increase in efficiency as by the size of their wage bill. They have, therefore, a large share in the creation of the present irrational fear that the workers, by increasing production, are only preparing a rod for their own backs. Nothing but a long education in fair dealing with piece rates will remove this obsession.

It is not fair, however, to ascribe all the decrease in British production to the employers alone. During the war, many industries were allowed to run down, so that their mechanical efficiency is below par. The miners claim that the underground ways in the mines are not in good repair, that the mechanical apparatus has been relatively neglected and that material for timbering and other operations subsidiary, but necessary for output, is scarce. In the building trade, the co-ordination of supply in respect of materials has not yet been re-established after the war. Difficulty in obtaining raw materials is often supplemented by scarcity of a particular kind of labor. Thus, a building may be waiting one week because of a scarcity of cement, and a few weeks after when a supply of cement has been obtained operations may be delayed because enough joiners cannot be obtained. A failure to co-ordinate the processes of production may lead to a relative decrease. Thus, in one case of refusal to work overtime cited to me, the machine shop of an establishment had run ahead of the moulders. The latter were asked to work overtime to enable the engineers to get ahead. Their refusal to do so meant that production in that establishment was relatively curtailed.

A very large amount of restriction in production at present is due to the congestion on the railways and the difficulty of transport. The supply of railway wagons was not kept up during the war. The armistice found many thousands of these wagons in France. They have not been returned. This scarcity of wagons has been made more serious by other dislocations on the

railways and the difficulty of securing transportation is one of the perpetual troubles of the business man to-day. The steel manufacturers of Tyneside have issued a statement that the position in respect to transport for the coming year means that no new plant can be put into operation. They estimate that, if they stopped their works for a month to enable the railways to do what they could in that period to clear off arrears of transportation, their works would still have to continue for some time on restricted output. While such a position obtains, it is not just to ascribe all the restricted output of Great Britain to labor.

The Serious Situation

But no amount of explanation can remove the seriousness of the situation confronting the industry of a country, where labor is not giving full output. What must follow if restriction is continued can be learned from the recent action of the well-known English piano manufacturing firm of John Brinsmead & Sons, Ltd. This firm, whose name is a household word in Great Britain, notified its employees that it would close down its manufacturing sections on Feb. 11, 1920. In a circular letter to each of its 300 highly skilled employees, the firm's manager said:

> **"You are aware of the low figure to which the output of the factory has fallen. For each piano despatched per week there are now 26 employees, against 12 in 1918, and six immediately before the war. The factory wages alone per piano exceed the selling price. The cost of polishing only is approximately equal to the pre-war prime cost of the completed piano, including materials."**

Another member of the firm, discussing the reason for the extraordinary rise in cost of production outlined above, suggested how far labor had affected the position. He remarked:

> **"I am afraid it is this question of output, not only in our own but in most trades, which is causing the ruination of the country. The trouble is that we are not getting the pre-war output from our workers. I do not know the reason, but that is the fact."**

The retort of the workers to the above charge has been that the organization is bad. This retort puts the whole contest concerning labor and output into a nutshell. British industry can overcome the incubus of high wages by increased organization and better management, but no measures can avail against a concerted decline in the quantity and efficiency of output. The end of such action is national bankruptcy.

This the British workman may be expected to see ultimately, even if somewhat late in the day, and to do his part to retrieve his nation's industrial position. The twofold fear of unemployment and of a cutting of piece rates can be removed. It is generally recognized that measures to relieve unemployment are the outstanding need of British industry. Several industries are giving attention to this matter and formulating schemes. The provisional committee of the joint council of employers and workers have recommended such action. The builders' national parliament has suggested a method for reducing the burden of unemployment in their trade, which is probably one of the most seasonal. On the question of piece rates, a wiser policy is coming into vogue. The rising wage market has made the cutting of piece rates an almost impossible operation. Employers are learning from the present experience that it pays to give good wages. They have been compelled, as seldom before, to yield piece rates satisfactory to their organized workers. They have found that, as a consequence, production has leaped up greatly, yielding high earnings to their employees. After they have got over their first shock and have put their newly installed cost accountants to work, employers have discovered that the increased output is being produced at a smaller cost per unit.

Must Learn Wage Economy

Before production can be increased largely, British employers must learn the economy of high wages. They must accept the responsibility of management to enable wages and costs to move in inverse order, so that higher wages mean lower costs. They must convince the workers that they will give them "a square deal" in the matter of piece rates, which they will not cut except by mutual consent. There must also be an advance in the efficiency of organization of their businesses, in the use of machinery and in the availability of transport alike by rail, canal and sea. On their part, the British workmen have much to learn. They must be relieved from the fear of unemployment and from the bondage of the short-sighted theory that restriction of output on the part of one group means more work for another group. They need to be educated to the necessity and value of efficiency in production.

A blind, complacent faith in their ability to muddle through and a smug confidence in the superiority of British craftsmanship may be all very well, but they do nothing to help Great Britain out of its financial difficulties or to meet the needs of an impoverished world. The British workman is slow to seize new ideas and slower still to grow alarmed at dangers that are obvious to people looking on at the industrial struggle. He remains an individualist in his thought, and must himself be convinced of the necessity for a course of conduct that his leaders have long recognized. Where he can, therefore, by education and the pressure of national necessity, be convinced of the need for production, he will yield it in large quantity and superb quality.

Box Handles of Webbing Save Shipping Space

IN export shipment, boxes loaded with 200 to 300 lb. are most easily manipulated when provided with handles. Usually such box handles are made of rope, inserted through holes in the ends of the box and secured with wall knots, or inserted in grooves on the under side of the cleats on the ends of the box, and held in place by nails or screws driven through the cleats.

The former method of fastening has the disadvantage of taking up valuable space in the interior of the box. The latter increases the thickness of the cleats to provide for a groove of sufficient depth to hold the rope, thereby increasing the displacement of the box. Since the rates for export shipments are virtually based upon the cubical contents of the package, the displacement is an important factor.

A box handle made of webbing instead of rope has been suggested by the Forest Products Laboratory as a means of conserving space. For this purpose webbing about ⅛ in. thick and 1⅛ in. wide, which has a breaking strength of 800 lb., should prove suitable. It may be inserted through saw-cuts made parallel to the grain in the ends of the box, turned down flat inside, and nailed securely with large-headed roofing nails.

Such a handle takes up no extra space. It is easily made and has a lifting strength with a large margin of safety.

The Need for Trained Highway and Transport Engineers

Although millions of dollars are available for road building, the trained personnel to direct the work has been lacking. Also, men cannot be found to supervise and operate the great fleets of motor trucks that are becoming such a factor in the nation's transportation problems. Consequently, the conference here related assumes important proportions.

PLANS for enlarging the scope of universities with the view of graduating trained highway and transport engineers were given impetus at a conference held at Ann Arbor, Mich., on April 15. The meeting was arranged by Roy D. Chapin, president of the Hudson Motor Car Co., in co-operation with the National Automobile Chamber of Commerce and the United States Bureau of Education. Leading authorities from educational institutions, officials of the N. A. C. C., road experts and leaders in several branches of the automotive industry participated.

The conference was called to express views that will be presented at a meeting in Washington to be presided over by P. P. Claxton, head of the Educational Bureau, at which definite steps are expected to be taken looking to development of plans along this line. Upon motion of Walter C. John, of the United States Bureau of Education, a committee of five—consisting of Professor A. H. Blanchard, in charge of highway engineering and highway transport at the University of Michigan; G. C. Diehl, chairman of the good roads board of the American Automobile Association; W. K. Hatt, professor of civil engineering Purdue University; Mr. John, and R. C. Hargreaves, vice-president of the National Highway Traffic Association—was named to draw up resolutions giving the result of the deliberations.

The Resolutions

"Whereas, American science and the industry has forged a new unit of highway transport destined to bring about far-reaching changes in life and thought, not only in this country, but in the world;

"And, whereas, it is a vital necessity to the economic development of these problems, not only in economical location, construction and maintenance of highways, but in the preparation of skilled men to undertake both the administration and operation of industries devoted to the production of those units of transportation;

"And, whereas, the American people have appropriated millions of dollars, which must be expended efficiently and intelligently;

"And, whereas, these problems call for the highest collegiate and vocational preparation which can both be solved through development of collegiate and vocational education in highway engineering and highway transport;

"Therefore, be it resolved, we representatives of education, industry and the government call upon P. P. Claxton, United States Commissioner of Education, to bring this to the attention of the people of the United States through a conference of leaders in thought and action on this subject;

"Be it further resolved, that in order to assist and advise with Dr. Claxton, the chairman of this conference is directed to name a committee of three representing industry, education and government."

Mr. Hargreaves, who acted as chairman of the meeting, appointed Mr. John, T. H. McDonald, director of the public road department at Washington, and Pyke Johnson on this committee.

The Need for Engineers

Discussion brought out the great need of industry in all branches for highly trained engineers to deal particularly with the problem of highway construction and highway transport. Evidence of the willingness and desire of college authorities to co-operate in bringing about a program that will meet this enormous demand was shown in the remarks of the speakers of that branch of the conference.

The matter of finances alone was declared to be the stumbling-block in the way of greater development along such lines in American institutions. Suggestions that the problem be solved by industrial leaders in selecting certain institutions in all sections of the country and endowing chairs of engineering were advanced by the college authorities and appeared to have been received favorably by the conference members.

In opening the meeting, Chairman Hargreaves spoke of the need for college trained engineers. He said the automobile had solved the problem of keeping hired hands on the farm and declared that in the construction and maintenance of highway transportation lay the future development of the country.

Mr. Chapin spoke at length on the dearth of competent highway and transport engineers. He stressed the point that this effort was not in behalf of the automotive industry but for the benefit of the entire country. He also presented figures showing that more than 7,500,000 automobiles are running on the highways of America today, and, figuring on a conservative basis, 25 per cent of the more than 100,000,000 inhabitants are riding in motor vehicles every day. The proper knowledge of soil to permit comprehensive road construction as well as trained minds looking to the upkeep of this immense fleet of motor vehicles and the roads upon which they travel, he declared, called for highly sensitive minds with the experience, judgment and balance that is furnished by a college training.

Knowledge of Soils

Frank F. Rogers, State Highway Commissioner of Michigan, who appeared as representative of P. D. Sargeant, president of the American Association of State

Highway Officials, gave a résumé of the situation from the standpoint of the road engineer. He declared highly trained men who knew soils alone would solve the problem of road construction. The ordinary road engineer, Mr. Rogers said, knows little of the fundamentals that enter into his duties and this lack of knowledge, he charged, was responsible for the short life of the modern road-bed.

H. G. Shirley, of the Federal Highway Council, said the problem of soil must be solved before road-building could be done properly and economically. The success of the transportation system, he declared, depends upon the structure of the road, adding that it was the function of colleges and scientific departments to get to the fundamentals and know the entire structure of roads so as to build intelligently. "We want roads so built that they can carry the same load from the Atlantic to the Pacific," said Mr. Shirley.

E. T. Herbig, chairman of the educational committee of the National Association of Truck Sales Managers, cited the need of efficiently trained men in the road departments. He said there were 700,000 motor trucks in service to-day, the initial cost of which was $2,000,000,000, and predicted there would be 1,000,000 in service by the end of 1920. "We are not selling motor trucks, we are selling transportation," he said. "The problem of loading and routing is the big feature, and there is need for the trained transportation engineer to master those problems."

Mr. Herbig said the motor bus was coming into use rapidly to take the place of the street car and he urged the trained driver as being necessary for the proper maintenance of these transportation systems. He voiced the need of the college trained engineer, not only in America, but every country, and told of the great opportunity afforded by this branch of science.

Activities of the S. A. E.

F. W. Davis, consulting engineer of the Pierce-Arrow Motor Car Co. and representative of the Society of Automotive Engineers, told of lecture courses at his factory designed to teach men the problem of truck transport and transport engineering. He told of the efforts of the S. A. E. to get the underlying facts in the science of transport engineering and formulate ways and means for such instruction in bringing out trained engineers, not only conversant with road-building but with the maintenance, routing and other details entering into successful transport. He emphasized the lack of a handbook and urged the formulation and tabulation of such information.

H. R. Cobleigh, secretary of the service division of the National Automobile Chamber of Commerce, declared the public up to this time had thought only of the established professions for the training of their children and had given too little thought to the automotive industry and its allied branches. He urged the possibility of going beyond the educators and getting to the heart of the public in the campaign of education along this line. Mr. Cobleigh told of the service department of the N. A. C. C., and said that it went back to the factory with the idea of training service executives, service managers, testers, stockmen and salesmen needing technical education. He declared it was impossible to train shopmen and said only a college training would suffice. The great dearth of service mechanics and shopmen, he said, was appalling and discouraging and the greatest hindrance to the industry.

Mr. Cobleigh declared the problem involved was taking care of cars and trucks after they have left the factory, emphasizing its importance equally with that of the design and construction of the vehicle. He said the school that graduates a man in six to eight weeks does not fill the need but turns out a class of incompetents. In citing the size of the industry as showing the importance of the appeal for higher training, he declared there were 250 manufacturers of cars and trucks in America to-day. Figuring the life of a car at six years, he said a million a year must be built for replacement. "You can't get the men ready too quickly," Mr. Cobleigh said, addressing the educators.

O. T. Hillshafer, of the service committee of the N. A. C. C., said he was called upon every day to furnish men who could be relied upon to handle big trucks and delivery car fleets and supervise construction and maintenance of roadways but declared that he could not find them. The few who are reliable, he said, are busy, and those who are available cannot be recommended. He spoke of the unlimited opportunities offered and declared America must have college trained men to keep this great demand supplied.

A General Problem

Mr. Chapin, at the beginning of the afternoon session, emphasized the fact that the automotive industry was a minor factor in the consideration of this great problem. He said that the general welfare of the country demands trained minds to deal with transport and traffic engineering and that it was not a question simply of training engineers and mechanics, but one which went back to the primary grades. He urged that men should be taught so as to be fitted for the particular type of industry they prefer to enter. In outlining the advantages offered, he said, managerial positions even to the advertising manager demanded a thorough knowledge of highway transport. He said the problem faced is one affecting the automotive field and the public generally.

Dr. Charles S. Howe, president of the Case School of Applied Science in Cleveland, declared the colleges were desirous of co-operating and helping in every way in their power in development of the movements suggested, but said they were handicapped by finances. "I would suggest that you take our students in vacation time, not with the idea of getting value received in service for the salaries you will pay them, but with the idea of training them for the big positions in your employ when they have developed into competent engineers," he suggested. "Give them practical work in different sections of the industry. You will get a line on their ability by the time they graduate and this will show you how capable they are for filling any want you may have. You cannot get men trained as you want them, unless you give them the benefit of practical experience to coordinate with our theoretical studies. It will be a great asset to you and, working together, I believe we can build the organization you need."

Independent of College Finances

Professor Blanchard suggested the selection of certain institutions scattered throughout the country with chairs of highway engineering, independent of college finances, and suggested that some of the industrial leaders, who talk freely in millions and billions, devote a part of their funds to building up the engineering profession. He urged arrangement of courses so that men may take advanced work in engineering during leaves of absence and told of the effort at the University of Michigan to concentrate highway engineering study into a two weeks' course devoted entirely to that subject.

The conference was followed by a meeting of the Detroit branch of the National Highway Traffic Association and the Board of Commerce at Detroit the same night, at which Horatio Earle urged road development and endorsed the suggestions made at the conference to-day.

AUTOMOTIVE INDUSTRIES
The Automobile

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The Airplane Industry

SALES plans of the syndicate which recently purchased the surplus aeronautical stocks of the British Government have not been announced in detail. But from the information so far received in America it appears that a world-wide attempt will be made to market the 10,000 planes, the 35,000 engines and the immense supplies turned over for civilian disposal by the huge transaction. The United States most certainly will not be overlooked in the clean-up of these stocks, as several events have indicated.

"To establish beyond question the supremacy of British aircraft in the world's markets" is the announced intention of the interests involved in the transaction. What that means, in terms of low prices, of competition with domestic builders, and of possible injury to the already overburdened industry in the United States, can be imagined readily when the full scope of the plan is considered.

The buyers declare they intend to establish commercial aviation on a basis of "wise organization, sound finance and great prosperity." And, without doubt, their concept includes the territorial limits of the United States.

But this country has an aeronautical industry which is, with all due respect to our Anglo-Saxon competitors, as capable and as skillful as any in the world. The American industry, unquestionably, is facing, as it has since the armistice, a slender hope of achieving a satisfactory financial basis on aircraft work. It can attain such a foundation only by the establishment and operation of commercial freight and passenger carrying lines.

Thus far, little capital has been invested in such enterprises. But the call for such investment—in American lines operating American planes with American personnel—at last has become urgent and deserves immediate attention.

The Need for Higher Education in Industry

IN this issue is printed the report of a meeting at Ann Arbor, Mich., at which was discussed the need for additional engineering courses in the universities to equip men to meet the transportation problems that have arisen with the development of the automotive vehicle. Especially is this true in connection with highway engineering.

The leaders in highway construction make no effort to hide the fact that the present engineers have not fully appreciated their problem and that the question of road construction must be entirely reopened. Roads that formerly were considered adequate for heavy transportation quickly "go to pieces" under the strain of truck and car traffic.

The university men with one voice say that they fully appreciate this situation but that they are handicapped by a shortage of money. They lack funds for the opening of special schools and lack money with which to pay their best professors enough to keep them from leaving the teaching tasks to join commercial staffs.

The question of roads is one of the big problems ahead of the automotive industry. Bad roads are a tremendous sales resistant. An investment in good roads is a direct sales investment. The manufacturer who endows a highway engineering chair in a university has made a definite investment for the future of the industry. To look at it another way, an endowment to provide good roads is that much invested in service.

Designing for the Export Market

A RECENT issue of the London *Times*, which has been much concerned with the "invasion of the English markets" by American car manufacturers, criticised the seating arrangements of one of the best known automobiles made in the United States. In this country, the machine is considered as one of the most luxurious and it is, without doubt, one of the costliest of the American models. But the *Times* considered it uncomfortable, although praising its other features.

In this same connection, an American exporter of automotive equipment found that the design of his product was not in keeping with the ideas of attractiveness and appearance demanded by his overseas purchasers. Consequently, the product was redesigned, polished up and given a better finish and the sales result has been reported as gratifying.

Discussing the English demands an export designer in New York declared recently that the British wanted a car in which they did not have to sit upright but in which they could lounge back in more comfort. The London paper has emphasized somewhat the same desires and has spoken at length of other American features that were claimed to be less finely finished or less ornate than on the corresponding British product.

The answer is hard to find, particularly in a market like the present, with demands high above the supply. But it is to be considered that the British and other foreign buyers know what they want. Consequently, it would seem that the American exporter should not forget this consideration when determining his model for overseas sale.

Chassis Lubrication

THERE is no other factor which equally affects the life of an automobile as lubrication of all wearing parts. In the engine efficient lubrication is absolutely essential and tolerably efficient systems were worked out in the earlier period of development. Chassis lubrication, on the other hand, was long neglected. In view of the fact that some of the chassis parts, like the spring bolts, are subjected to very high bearing pressures, their wear when unlubricated is very high. Some means for lubricating these parts has, of course, always been provided, even if nothing else than an uncovered oil-hole or a compression grease cup. The trouble is that if the oiling places are inaccessible, or if the job of renewing the supply of lubricant is onerous, the owner of the car will shirk it. In this respect the modern systems of engine lubrication are almost ideal. Everything is lubricated automatically and all the operator has to do is to periodically draw off the supply of stale oil and replace it with fresh oil. A circulation indicator or pressure gage keeps him constantly informed whether oil is being properly fed to the bearing surfaces, and an oil gage indicates to him the level of oil in the engine sump. Even the process of renewing the oil has been made as convenient as possible by placing the filler spouts in more accessible positions.

If the chassis lubricating system could be worked out in a similar way it would certainly be a great advance over our present methods. However, the difficulties in the way are easily realized. The engine is now a compact unit, completely enclosed, with all the bearings on the inside, while on the chassis the bearings are widely scattered. If the chassis bearings were to be lubricated from one or two central points, a great many pipe connections would be necessary, and such oil piping would be very objectionable, on account of the danger of breakage and of leakage at joints. Even in engines we consider it quite an improvement if we can dispense with the comparatively short lengths of outside piping sometimes used to connect the pump with the sump and the distributing passage. The chances of leakage, etc., are, of course, much greater if connections have to be made to unsprung parts like the rear axle. It is quite obvious that this central supply chassis lubricating system is adaptable only to high-grade cars, because of the high grade of workmanship required to make the oil distributing system enduring. And in the case of the higher priced cars there is really less need for an automatic oiling system, because these are generally driven by chauffeurs who have plenty of time to look after the machine.

For the great bulk of moderate priced cars that are usually driven by their owners the solution of the chassis lubricating problem seems to lie in methods of individual supply so worked out as to require less frequent attention, to be more accessible and less messy. That much thought is being spent upon this problem, in the truck field, as well as in the passenger car line, is evidenced by the frequent references to improvements in lubrication in descriptions of new vehicles.

Taxes Heavy on Aviation

A CONSTRUCTIVE act for the development of commercial aviation by Congress would be the cancellation of all tax measures in so far as they may relate to aeronautics.

Recently several New York financiers, approached by ex-Army fliers, were favorably inclined toward extension of financial credit for an aerial transport company. Plans were made to purchase ground for a field and airplanes and other equipment, when it was discovered that State and Government taxes would be so great that the chances of earning money were slight as compared with the chances of losing it, and the project was abandoned.

France, though hard-pressed for funds and asking assistance from other countries, is shrewd and clever enough to realize the possibilities of the control of commercial aviation, and despite its needs, France has set aside 18,000,000 francs for the subsidization of airplane plants and pilots, to insure the development of French aviation.

Increasing Production

IN these days of labor difficulties and curtailed production it is refreshing to see a little sunshine through the rain. Reporting for thirty companies, which represent about 85 per cent of the total American output of steel engines, the American Iron and Steel Institute states that the production for the month of February was between eight and nine per cent more than that for the month of January. Estimating the total capacity of these plants at 15,000,000 tons, February showed a production efficiency rate of 89 per cent.

Insurance Rates Show New Increases

Collision Rates Take Radical Jump, with Slight Increases on Other Points

NEW YORK, April 19—New insurance rates on automobiles for public liability, property damage and collision hazards prepared by the National Workmen's Compensation Bureau, became applicable to all new business April 15, and will apply to all renewals dating from June 1. Features of the new rates are a moderate increase for public liability on passenger cars, a substantial increase in public liability rates on commercial vehicles, and a radical increase in collision rates for all classes.

General rate increases will be found to be principally applied in the congested traffic territories. This amounts to about 10 per cent for passenger cars and approximately 35 per cent for commercial. The new rating continues the car valuation as the basis, but by establishing a key symbol for each make of car has obviated the defect in last year's system, which resulted in an advance in the premium rate every time the maker of a car advanced his selling price.

Collision rate advances are based on very unprofitable experience of all companies and while varying greatly according to the types of cars, on the whole amounts to at least 40 per cent over last year's rates. The property damage rates are based upon the inclusion of loss of use liability and are slightly less than last year's rates for the two hazards combined. Territories have been slightly modified but in general conform to last year's boundaries, with the important exception that a new intermediate territory between six and seven has been created.

Listings of Cars Changed

The Bureau in issuing the new manual gave a summary of some of the more important changes, in which it said:

"To eliminate the discrepancies in liability and property damage rates caused by variations in the list price of automobiles, it was decided this year to symbol all automobiles for liability and property damage. This will place the 1916 automobile and the 1920 automobile on the same basis and the rate for both will be alike. It is clear that the hazard for property damage and liability is similar for both cars and the rates should therefore be the same. It will be found that with few exceptions last year's liability and property damage rates for private passenger automobiles are continued.

"The collision experience collected this year showed a decided increase in loss ratio and made it necessary that all collision rates should be increased. It was also found that the proportion of losses for new cars was greater than for old cars. Three age classes have been established. New cars as defined in the manual are given the highest rates; cars one year old as defined are given a lower rate and cars over one year old as defined are given a still lower one. It was also found that at the present time it costs just as much to repair a 1916 model as it does to repair a 1920, and for that reason collision rates for both models should be alike. To accomplish this all automobiles have been given symbols for collision insurance just as they are for liability and property damage.

3 Load Capacities for Trucks

"A very material change is made in rating commercial vehicles. The number of classifications as to business has been materially reduced. On the other hand the experience collected indicated that the proportion of losses increased as the load capacity increased and three load capacity classifications were established. The first is for trucks with load capacity of one ton or less and is called the light class; the second from more than one ton to 3½ tons inclusive is called the medium class, and the third or heavy class includes all trucks over 3½ ton capacity. This division of load capacity is not made for fire engines, police patrols and other similar emergency vehicles.

"Collision insurance for commercial vehicles provides no age distinction as is established for private passenger cars. As with passenger cars, commercial vehicles have also been symbolized for collision insurance. However, as most of the prices for commercial cars cover only the chassis, a separate table of symbols has been prepared for the complete car—chassis, body and additional equipment. A special rate slightly lower than the regular classification was established for farmer's trucks and a special indorsement prepared to be used in connection with such rates. Farmers' trucks, however, should not be confused with farm tractors, which also have a special rate.

"The eligibility requirements for experience rating have been somewhat lowered as respects the number of automobiles. No distinction is made between private passenger automobile fleets and commercial automobile fleets. It should however be noted that all automobiles to be eligible must be strictly under one ownership and under one operating management, and the experience for automobiles of officers, salesmen or other employees cannot be included, nor can the rate produced by such experience be applied to these automobiles."

EXTEND TIME ON TRAILER TAX

WASHINGTON, April 16—The Treasury Department has directed the Internal Revenue collector to advise all manufacturers of their liability to tax on all sales of semi-trailers on and after Feb. 25, 1919, and to collect the tax due the Government. Because of the fact that there was a general misunderstanding regarding the taxability of semi-trailers they have been granted an extension of time until June 20, next, in which to make returns and pay the tax due prior to April 1, last.

Propose Seasonal Licenses in England

Would Supplant Yearly Tax with Quarterly or Semi-annual Permit

LONDON March 30 (*Special Correspondence*)—The Committee appointed by the Ministry of Transport last November to consider the question of the taxation of road vehicles is on the eve of presenting its report.

The Committee will propose sweeping changes in the present scale of licenses for motor vehicles. It is understood that the Committee will recommend that private motor-cars shall bear a tax of £1 for every unit of horse-power. The present scale begins at two guineas for cars not exceeding 6½ horse-power; rises by easy stages to £21 for cars between 40 and 60 horse-power, and ends at £42 for cars exceeding 60 horse-power.

The Committee propose that commercial motor-vehicles shall be taxed according to their unladen weight. They recommend that the tax shall be £16 on such vehicles not exceeding one ton, £21 between one and two tons, and £30 over four tons.

The Committee recommend that the present system of annual licenses should be abandoned in favor of quarterly, half-yearly, and yearly licenses, whichever motor users elect to take out. It is thought that this option will afford some measure of relief by enabling motor users to escape taxation during the bad weather season in which their cars are in the garage.

MAXWELL TO BUILD BODIES

DAYTON, April 16—Announcement is made by Bruce Ott, manager of the Maxwell plant here, that the Dayton factory will be used for the manufacture of bodies. In addition to manufacturing them for Maxwell cars it will produce about half of those used for Chalmers cars. The Leo Street Maxwell plant will he reopened and employment given to about 600 more workmen. The transfer of body work to this plant, which formerly was used for the manufacture of axles, will permit the use of the Third Street plant for closed bodies exclusively.

BAKER R & L GETS CITATION

CLEVELAND, April 16—The Baker R & L Co., manuacturer of Baker electric industrial tractors and trucks, has received official notification of citation by the United States War Department for "special effort in rendering valuable service by prompt execution of orders and intelligent co-operation." The citation is given on the recommendation of the chief of construction division and the notice of citation is signed by Major General George W. Burr, Assistant Chief of Staff, director of purchase, storage and traffic.

G. M. C. Sales Total $509,676,694 in 1919

President Durant, in Annual Report, Outlines Divisional Growth of Company

NEW YORK, April 16—A tremendous increase in the earnings of the General Motors Corp. was announced by W. C. Durant, president, in his annual report to the stockholders made public to-day. Net profits for 1919, after deducting all expenses of manufacturing, selling and administration, ordinary taxes, depreciation, employees' bonus stock, employees' investment fund and allowances to employees on bonuses, amounted to $90,517,519, compared with $35,504,376 in 1918. Federal taxes and extraordinary expenditures absorbed $30,000,000, leaving a balance available for preferred and debenture dividends of $60,517,519, an increase of $45,126,491.

The 1919 surplus, after all charges, including dividends on the preferred and debenture stock, was $55,792,972, equal to $36.35 a share on the $153,411,000 common stock outstanding, compared with approximately $9 a share earned on $147,379,900 common stock in 1918.

Net sales of the corporation and its subsidiary companies for the year were $509,676,694, against $326,044,756 in 1918, an increase of $183,631,938, or 56.3 per cent. The number of passenger cars, trucks and tractors sold was 406,158, compared with 246,834 the preceding year, an increase of 64.5 per cent.

Working Capital, $158,754,500

Net working capital of the corporation, as disclosed by the balance sheet of December 31, 1919, amounted to $158,754,500. Total current assets were $215,824,785 contrasted with current liabilities of $56,180,402. Notes payable of $6,812,318, the report said, represented $4,074,118 borrowed by subsidiary companies, and the balance of $2,738,200 covered miscellaneous indebtedness assumed by the company in the purchase of properties.

Other indebtedness of the company at the close of the year consisted of current accounts payable of $37,846,313 and $11,521,770 liabilities accrued but not due, for payrolls, ordinary taxes, etc.

"While it will be seen from the above," says Mr. Durant, "that the net working capital has been increased during the year by $8,852,472, attention is called to the fact that the increase in net working capital, exclusive of United States government bonds, amounted to $37,491,271. The amount, $28,852,018, invested in United States government bonds in 1918 and temporarily carried in working capital, was converted during 1919 into cash and the proceeds used for new construction, as was intended."

Looking into the future, Mr. Durant said: "There is no diminution in the demand for your product, the number of passenger cars, trucks and tractors sold for the first quarter of 1920 to March 31 being $119,779, as compared with $82,456 for the corresponding period of the previous year, an increase of 45.2 per cent. The net profits for this period, before deducting Federal taxes, are estimated at upward of $26,500,000."

The payroll of the company for 1919 totaled $104,380,000. The number of employees in its service at the end of the year was 85,980, compared with 49,118 at the close of the year preceding. The number of stockholders, the report said, is in excess of 24,100, of whom 6,650 are employees.

In discussing the expansion of the corporation, President Durant said:

Buick Production 500 Daily

"Expansion of manufacturing facilities at the plants, which was necessarily interrupted during the war, has been resumed. During the year the capacity of the Buick division was increased from a production of 350 passenger cars a day in January, to 500 a day during the last quarter. Construction now under way at Flint and St. Louis will bring total productive capacity for Buick cars to more than 700 a day. Capital expenditure on this division during 1919 was $5,018,660.

"Construction was started on a new factory for the Cadillac division early in 1919. Rapid progress is being made on this plant, which will embody the very latest ideas for economical manufacture, and when completed this factory will have a capacity of approximately 30,000 passenger cars per annum. New construction by this division required $4,937,160 during the year.

"During 1919 the productive capacity of the Chevrolet plants at Flint, Tarrytown, Fort Worth, and St. Louis was increased to 800 cars and trucks a day; additional construction under way will, when completed, permit the production of 900 passenger cars and 50 trucks a day. Capital expenditures of this division during the year required $7,420,460.

"Rearrangement of the Pontiac plant of General Motors Truck division, and additions to present buildings, will permit the production of 20,000 trucks per annum. Congestion at the Pontiac plant will be largely relieved by the establishment of an assembly plant in eastern territory during 1920.

Oakland to Make 350 a Day

"With the completion of new construction started in 1919, the capacity of the Oakland division will be increased to 350 passenger cars a day.

"At a cost of $2,552,090, the capacity of the Olds Motor Works was increased to 300 passenger cars and trucks a day.

"The Scripps-Booth division in its new factory will be able to produce 100 cars a day.

"New facilities, which are practically complete, will give the Samson Tractor division a capacity for turning out 100,000 tractors a year.

"The corporation was fortunate in assuring an enlarged supply of bodies through the acquisition of a majority interest in the Fisher Body Corp."

Service Managers To Study Systems

Factory Representatives to Meet in Indianapolis Under N. A. C. C. Auspices

NEW YORK, April 16—Factory service managers from all parts of the country will hold a convention at Indianapolis May 24, 25 and 26. The convention will be under the direction of the Service Committee of the National Automobile Chamber of Commerce, and is intended as a follow-up to the Service Convention which was held last November in Detroit.

These service conventions are not a new departure for the Chamber, but rather the taking up of the reins where they were laid down at the time this country went to war. Several were held some years ago, but the Detroit meeting marks the first of the post-war conventions. As a starter, the first one necessarily dealt with service in a very broad and general way, covering so many phases of the subject that not very much could be done on any one thing. But it started the ball rolling and now the second post-war convention will get down to brass tacks. Boiling the activities of the subjects down to a single sentence, the effort will be "To get a better conception of service on the part of all parties concerned."

The first two days of the convention will be devoted to the reading and discussion of a number of papers, the first day's subjects being "Service considered from outside the service department." The following day the talk will turn to "Service considered from inside the service department." Titles of some of the papers will be, "Salesman's responsibilities in connection with service," "Owner's responsibilities in connection with service," "Methods of estimating charges for service," "Repairshop efficiency methods," "Stockroom efficiency and sales methods."

It is probable that there will be some talk about the new service division of the N. A. C. C.

Al Reeves will be chairman of the daily sessions, and L. C. Voyles, Service Manager of the Nordyke & Marmon Co., and President of the Automotive Service Association of Indiana, will be in charge of the trips on the third day.

The Service Committee consists of E. T. Herbig (Service), chairman; H. W. Drew (Packard); W. M. Ladd (Pierce-Arrow); A. B. Cumner (Autocar); W. M. Britton (Republic); O. T. Hillshafer (Chandler); W. B. Riley (Jordan).

OLDFIELD ENTERS SPECIAL

INDIANAPOLIS, April 16—Barney Oldfield has entered an "Oldfield Special" of 182 cu. in. piston displacement, for the sweepstakes Memorial Day. The car was put together by Harry Miller of Los Angeles. Oldfield has not announced who will drive it.

Hub Standardization Manufacturers' Aim

Wheel, Bearing and Axle Makers' Convention Planned to Settle Problems

BUFFALO, N. Y., April 16—A combined meeting of manufacturers interested in the standardizing of truck hubs will be held at Atlantic City, June 7, if the plans of the Automotive Metal Wheel Association carry out. Such a decision was reached at a special meeting of the association held here this week, when the various problems in connection with further standardization of truck hubs were analyzed.

The association is issuing an invitation to the members of the Automotive Wood Wheel Manufacturers' Association, which has been active on this phase of truck standardization and has had a special engineering research conducted in connection with it for some time. Others invited will include the manufacturers of axles for motor trucks, as they are naturally interested in hub standardization; and also those truck manufacturers producing their own axles.

The bearing manufacturers are concerned in this standardization work in that different bearing sizes call for different machining operations and interfere with axle standardization. The meeting should bring together upwards of a hundred manufacturers representing these various lines, and all of whom are interested in standardization work. It is possible that tire and rim manufacturers may also participate in the meeting.

To-day's meeting served to bring to the surface many of the standardization problems in hub and wheel construction which are holding back production and increasing the cost of such parts. No time is more opportune than the present to carry out this standardization work in that metal wheel manufacturers, wood wheel manufacturers, and axle makers are studying the problem of the pneumatic tire and redesigning their apparatus to meet pneumatic tire requirements.

Outline Points of Variance

Some of the wheel manufacturers want the rim makers to standardize on the distance between the bevel surfaces which support demountable rim on the wheel felloe. The distance between these surfaces is different on different rim sizes which calls for different manufacturing fixtures.

There is necessity for some agreement on what is known as "the bolt circle diameter," which refers to the transverse bolts passing through the felloe to secure the demountable rim in position. With the pneumatic tire but one wheel diameter is used, but there is a difference in the diameter of this bolt circle which calls for different jigs, etc., by the manufacturer. The difference is so slight that many of the makers think it could be eliminated.

It is matters of this character that, as one wheel maker put it, call for manufacturing over a hundred different models of wheel hubs, and necessitates an investment of $500,000 in special jigs, tools, and other equipment.

There was a great deal of discussion because there seems to be no specific ruling as to the spacing between the bearing in the front wheels of a motor truck. Instances were cited of a 2½-ton truck which had the bearings spaced 3½ inches apart, whereas on a 3-ton truck they were spaced 3 inches apart. Naturally the spacing distances of the bearings call for corresponding machining in the hub. If there were some uniform spacing distances it would facilitate the work of the wheel maker.

Atlas Takes Over M.-P. Truck Interests

NEW YORK, April 16—Stockholders of the Martin-Parry Corp. have ratified the proposal of the directors for the sale for cash of all assets of the company engaged in the manufacture of trucks to a new company to be known as the Atlas Truck Corp., headed by J. P. Watson, Jr., present chairman of the board of the Martin-Parry Corp.

Stockholders were informed they would have the privilege of subscribing to 25,000 shares of the new corporation at $5 a share and to 35,000 shares at $17 a share which is the price the syndicate of underwriters guarantees.

The officers explained that the reason for selling the truck business is that they were encountering trouble with rival truck makers who are customers for truck bodies which is the main business of the company.

The new corporation has been incorporated in Delaware with a capital of $15,000,000.

TO BUILD AXLE BRANCH

WEST BEND, WIS., April 19—The American Axle Co., of Chicago, an Illinois corporation with $500,000 capital, and manufacturing worm-drive axles for passenger and commercial cars, has decided to establish a branch plant in Barton, a village near West Bend, Wis. Work will start at once on the erection of a one-story shop.

G. M. C. LOCATES ENGINEERS

DAYTON, OHIO, April 16—All research and engineering laboratory work of the General Motors Corp. will be centralized at the plant of the Dayton-Wright Airplane Co. here. About 1600 laboratory men, chemical and physical engineers, etc., will be employed.

SIMMS TO DOUBLE OUTPUT

EAST ORANGE, N. J., April 16—The Simms Magneto Co. has begun construction of an addition to its plant which will permit an increase of more than 100 per cent in production. When the work is completed in August it will permit a daily production of from 1300 to 1500 magnetos a day.

Day-Elder Loses Suit to Sales Head

Court Decides Manager Not Limited in Choice of Sales Headquarters

NEWARK, N. J., April 16—A decision adverse to the Day-Elder Motors Corp., in its contract suit against Percy K. Hexter has been handed down in Chancery Court by Vice Chancellor Fielder who upholds all the contentions of the defendant. The company announces that it will appeal to the Court of Errors and Appeals.

The suit was the outgrowth of a contract entered into between the corporation and Hexter on Dec. 26, 1916. The agreement provided that Hexter was to serve as sales manager for three years with the stipulation that it should be renewed under certain conditions.

As sales manager, Hexter was to receive 5% commission of the list price of all motor truck chassis sold. If he sold 1,400 in the first three year period it was to be renewed for five years upon the same terms and if he sold 4,000 chassis in that time it was to be renewed for another five years. It was further agreed that the Day-Elder Corp. should deliver to Hexter 5,000 shares of its stock which would become his unconditionally if he fulfilled all the conditions imposed. If he sold 1,400 chassis in three years a proportionate part was to be his absolutely and if he sold 4,000 in five years a larger proportionate part was to be his and if 10,000 were disposed of in thirteen years he was to be the owner of all of it.

In Sept. 1918, Hexter decided to enter the military service and a supplemental contract was made which provided that the company was to take over the sales organization and pay all its expenses until he returned. When Hexter went to war, the sales force was moved from New York to the factory at Irvington. When Hexter was discharged from service, the corporation insisted he should direct sales from Irvington while he wished to open his office in New York. When he persisted in his refusal to comply with the company's directions in this respect he was discharged.

Had Only to Complete Sales

The Day-Elder company alleged breach of contract and sought the recovery of the 5,000 shares of stock. Chancellor Fielder holds that the contract did not specifically give the company the right to dictate where the sales headquarters should be located and that it was Hexter's privilege to have his offices wherever he pleased so long as he carried out the selling end of his contract. He was not bound to devote all his time to the Day-Elder Corp., but was required only to sell a certain number of chassis. In two years he sold all that was required for three years.

The court finds that the contract provided that if Hexter should cease to be employed, without any fault of his own, the stock should be his property.

Canada Enrolls New Air Militia

Camp Borden Taken Over for $5,000,000 to Train New Forces of Dominion

OTTAWA, April 16—Applications are coming in at the offices of the Air Board at the rate of fifty and sixty a day for enlistment in the new Canadian Air Force. All the applications are from ex-officers in the Royal Air Force.

Preparations are already under way at Camp Borden, western Ontario, for the establishment of the first training camp of the force. Officers of the new force will train at Camp Borden in periods of a month or so at a time. There are adequate facilities there for the training of nearly three thousand men at a time. The equipment installed by the Royal Air Force at Camp Borden has been taken over by the Canadian Government for the use of the Canadian Force, including eighteen hangars and substantial permanent buildings.

The building of this flying base cost the Imperial Government $5,000,000, and comprises an up-to-date airdrome and barracks. It is only a few days since it was announced by the Federal Government that a Canadian air force was to be formed immediately.

The personnel will be drawn from volunteers from the ranks of ex-officers and airmen of the Royal Air Force resident in Canada. These will train at centers, which will be in operation all the year round, and officers and airmen enlisted in the new force will spend at least one month out of every twenty-four in active training, receiving pay and traveling expenses during their active period.

The force probably will be limited in the beginning to about five thousand, inclusive of all ranks, and the training centers will not number more than one or two to begin with for the whole Dominion. It is understood that the government wishes to avoid an expensive permanent organization. The organization of the force will be placed in the hands of Canadians who have had experience at home and on the war fronts in flying, and who are interested in building up a Canadian air militia, which can readily be extended and mobilized in an emergency. Age limit is set at about 30 for junior officers, and 38 for senior officers.

Applications for enrollment in the new air force, giving all particulars of previous service, may be sent at once to the secretary of the air board at Ottawa.

Volunteer provincial executive committees of seven, acting without remuneration, will administer the force by provinces.

UPHOLD WOVEN TIRE PATENT

TRENTON, N. J., April 16—The United Circuit Court of Appeals at Cincinnati has affirmed the decision of the District Court granting the de Laski & Thropp Circular Woven Tire Co. of this city an injunction restraining the Miller Rubber Co. of Akron from infringing a patent which was held valid. The court ordered an accounting of profits and damages against the Miller company, and this has been settled.

In a similar suit brought against the Empire Tire & Rubber Co. of Trenton the United States Court in New Jersey also found in favor of de Laski & Thropp and a master awarded them more than $20,000 in damages.

General Motors Buys Doylestown (Pa.) Plant

NEW YORK, April 17—General Motors Corp. has purchased the Doylestown Agriculture Works at Doylestown, Pa. It expects to erect there within two years a $1,000,000 plant for the manufacture of automobiles and farm machinery. The new plant, in which 2,000 persons will be employed, will be built along the Doylestown branch of the Philadelphia & Reading Railroad. Options have been obtained on numerous tracts.

General Motors will continue the manufacture of farm machinery for export at the present plant.

MARMON GETS CITATION

INDIANAPOLIS, April 16—The Nordyke & Marmon Co. has been cited by the War Department for distinguished service, energy and efficiency in turning out engines for training planes and Liberty motors.

Firestone Expends Million in Straits

Economy in Rubber Handling Planned to Offset Raw Material Costs

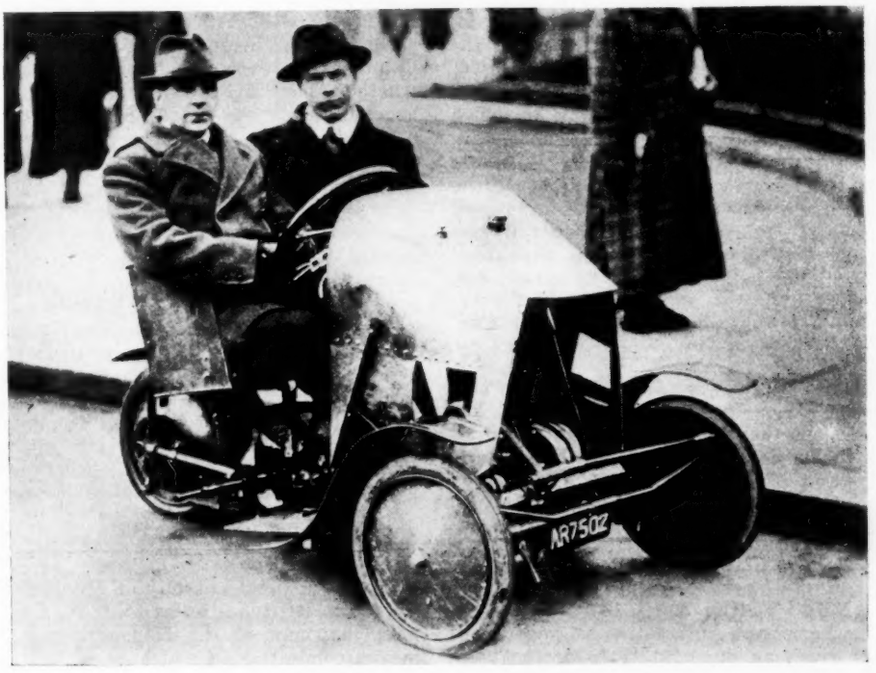
AKRON, April 16—The Firestone Tire & Rubber Co. announces that its main purpose in erecting its $1,000,000 plant at Singapore, Straits Settlements, is to offset mounting costs of raw materials, especially cotton for fabric. The machinery which is being shipped to the Far East is designed to replace time consuming methods of handling crude rubber. The saving is expected to amount to hundreds of thousands of dollars annually.

The plant will clean and compress the rubber in such manner that it will occupy less space aboard ship, thereby saving on freight charges. The cleaning process, carried on by coolie-operated machines, will also effect a saving in that it will permit the rubber to go to the skilled hand of the mill operator immediately upon its arrival in Akron.

The plant will effect a further saving by making it possible to sidestep numerous middlemen. According to S. G. Carkhuff, secretary of the company, who returned to the United States recently from Singapore, it will be the only factory of its kind owned and operated by a rubber tire company.

Firestone crude rubber requirements will demand the productive efforts of 100,000 persons throughout the year, even after the plant is in operation.

This Is a "Tankette," London's Latest



Not built for looks, just for service, is the way the latest thing in miniature automobiles is described. There is room for two passengers, and it manages to get to its destination safely and in fast time

Foreign Trade Bank Formed in New York

First Federal Banking Association Notifies Manufacturers of Exchange Policies

NEW YORK, April 16—A preliminary permit for organization has been granted by the Federal Reserve Board to the First Federal Banking Association, the first organization to apply for a charter under the provisions of the Edge bill. It is expected the bank will be ready for business by June 1.

The new organization will have a capital of $2,100,000 and the stock has all been underwritten at $105 a share. None will be offered to the public. The banks which are associated in obtaining the charter are: Aldred & Co., Bank of the Manhattan Co., New York Trust Co., Liberty National Bank, Tucker, Anthony & Co., of New York; Citizens Commercial Trust Co., Buffalo; American Trust Co., Boston; Merchants National Bank, Worcester; Chicopee National Bank, Springfield, Mass.; Commercial Trust Co., Philadelphia, and First Bridgeport National Bank, Bridgeport, Conn.

W. S. Kies of Aldred & Co., formerly vice-president of the National City Bank and the American International Corp., will be chairman of the board. With him will be associated J. H. Perkins, former executive manager of the National City Bank.

A statement issued by Kies explains that banking associations organized under the Edge bill may do a general international banking business, deal in exchange and provide the various facilities needed in foreign commerce. Under the law liabilities in the form of acceptances and other obligations may be issued to the extent of ten times the capital and surplus.

Letters have been sent to manufacturers interested in foreign trade in which it is asserted that if American manufacturers are to continue doing business in other countries they must absorb the exchange loss, increase prices or extend credits. It is explained that the new bank will be able not only to extend credit but to loan capital to extend foreign trade.

LIFT PARCEL POST BANS

WASHINGTON, April 16—The Postoffice Department announces that retrictions have been removed on shipment by parcel post to Great Britain and Ireland of the principal and accessory parts of automobiles, and motorcycles except pneumatic tires.

S. A. E. TO MEET IN GAMES

NEW YORK, April 18—Members of the Society of Automotive Engineers will be given an opportunity to demonstrate their prowess in a series of games which will be conducted during the summer meeting at Ottawa Beach in June. As an incentive to the utmost effort along this line and as an antidote to the mental effort which will be required at the business sessions, prizes will be offered for the most creditable performances. To provide the funds companies represented in the membership will be permitted to contribute not more than $25 each. On the program will be baseball, golf, tennis, water sports and field events. Prizes will also be awarded to the women who win at golf, tennis, croquet, whist and five hundred.

Applications for rooms at the summer meeting already received at headquarters here number 178. Included in the early applications for accommodations are 41 women.

Michigan University to Repeat Courses

DETROIT, April 17 — During 1920-1921, the University of Michigan will offer twelve graduate, short period courses in highway engineering, and six in highway transport. Each course consists of thirty lectures to be given in a period of two weeks during the months of December to March, inclusive. Arthur H. Blanchard is professor in charge of this work.

A highway laboratory has been established, being equipped for the testing of stone, gravel, brick, cement and bituminous material. In order to make the laboratory of the greatest possible use in the development of the State highways, plans have been perfected for the testing of road making and paving materials intended for public use in Michigan, without any charge other than the expense in shipping samples. The University fee for each of the courses will be $10.

BUYERS PROPOSE CONVENTION

NEW YORK, April 16—Members of the National Automobile Chamber of Commerce have been asked to indicate whether they believe a convention of purchasing agents would be productive of good results. It has been suggested that such a meeting be held at some centrally located city in May or early June to consider some of the most pressing problems which confront purchasing agents of automobile plants.

LADISH FORGE EXPANDS

MILWAUKEE, April 19—The Ladish Drop Forge Co., of Cudahy, a suburb of Milwaukee, has increased its capital stock from $300,000 to $700,000 and will further increase its facilities. It manufactures a wide range of automotive parts and is one of the pioneer drop forge shops in the Milwaukee district.

SEEKS TAX REVISION

SOUTH BEND, IND., April 16—A. R. Erskine, president of the Studebaker Corp. has written a letter to J. W. Fordney, chairman of the House ways and means committee in which he makes an appeal to Congress to revise tax legislation. Especially those sections relating to excess profits, the surtax of income and the tax on mortgages.

Indiana Factories Hard Hit by Strike

Shortage of Fuel and Materials Forces Suspensions at Indianapolis Plants

INDIANAPOLIS, April 22—If the outlaw switchmen's strike is not settled by the end of the week, Indianapolis motor car and equipment makers will face the necessity of shutting down, either next week or a few days later. Conditions in local railroad yards are not so bad, but the local factories are carrying the weight of shipping conditions in other centers.

George M. Dickson, of the National Motor Vehicle Corp., said his plant would be forced to close probably next Monday if relief is not afforded. However, at the Nordyke & Marmon plant, while conditions are serious enough, it is said that they have enough material to supply their needs for two or three weeks. The Weidely Motors company will be able to operate four or five days more, according to President George Weidely. J. J. Cole, of the Cole Motor Co., said to-day that his factory could operate one week longer.

Unless relief is given within the next few days, a shut-down of the LaFayette Motors Co. is imperative, according to M. J. Moore, treasurer of that company. Lack of materials and parts is seriously interrupting work there. At the Stutz Motor plant it was said that supplies were had sufficient to run the rest of the week, but that it was doubtful if operations could be started next week unless shipping conditions are ameliorated. The Cole Motor Co. hauled a supply of motors from Detroit, which it would not have been able to transport by rail for some time.

Improvements are noted in the coal situation for Indianapolis, a number of cars destined for Chicago and other centers having been diverted to yards here. The Merchants Heat and Light Co. and the Indianapolis Light and Heat Co. are in no immediate danger of a complete shut-down from a coal shortage.

First Suspension in Five Years

The Maxwell plant at Newcastle, Ind., after working on a half-day schedule, suspended operations yesterday, throwing 3,000 people out of employment. The factory, because of the strike, is unable to get raw materials and no more finished products. The factory has plenty of coal. This is the first time in more than five years that the factory has been entirely idle.

At Muncie, it was said, that unless the strike is ended, 5,000 men in the Muncie factories will be thrown out of employment. No switchmen are out at Muncie. The Muncie plant of the Indiana General Service Co. supplies several factories in Hartford City, Marion and smaller towns near, and may be compelled to shut off service to these plants to conserve coal.

Trucks Avert Food Crisis in Strike

Hundreds of Carloads of Supplies Are Brought to New York Over Roads

NEW YORK, April 19—Virtually complete paralysis of railroad freight transportation in the metropolitan district as the result of the "rump" railroad strike has centered attention more than ever before upon the motor truck and it has been used to a greater extent in short haul distribution of foodstuffs. As a consequence large distributers of produce have decided to carry on their trucks hereafter a considerable part of their wares which hitherto has come in by rail.

Hundreds of carloads of perishables stalled in nearby New Jersey cities and at other points within a radius of fifty miles have been unloaded on trucks and brought to the city without difficulty. Fresh shad was shipped by truck from Baltimore and other fish from Portland, Me. The contents of forty cars loaded with fresh meat were brought in from Port Jervis, 90 miles away, and great quantities of farm produce from Long Island.

Many fleets of trucks were organized to bring in foodstuffs and vegetables from Baltimore, Boston, Washington, Camden and other points. A carload of California asparagus was transported from Tarrytown in the same way. New England makers of boots, shoes and rubber footwear used trucks to transport this merchandise from Boston to New York, making the trip in about 24 hours.

Another result of the strike was the charting of complete plans for feeding the city by truck in the event of a real emergency. The three agencies which co-operated in making these plans were the Council of National Defense, the Motor Transport Corps of the Army and the Motor Truck Association of America. Provision was made to cover the entire Department of the East.

Strike Booms Truck Movement

AKRON, OHIO, April 20—Information received from all parts of the country at the Firestone Ship-by-Truck Bureau here shows that the "outlaw" switchmen's strike gave tremendous impetus to the movement as well as a practical demonstration of its possibilities. There was scarcely a good sized city in the country which did not fall back upon trucks for the transportation of food and other necessities.

Chicago, the first city hard hit, was the first to call upon the trucks for aid. The big packing houses kept fleets moving with shipments not only to all parts of the city but to other places as well. Morris & Co. kept fifty trucks in operation day and night supplying Racine, Elgin, Gary, Waukegan and Kenosha.

Cleveland, Toledo and St. Louis cleared thousands of tons of freight by trucks. In the larger places operations were under the direction of the Chamber of Commerce. Other cities which used trucks effectively were Philadelphia, Boston, Albany, Hartford, Scranton, Harrisburg and Newark.

The Firestone company sent fleets of trucks to the East to deliver tires and brought them back loaded with cotton fabric and other supplies from the mills in New Jersey and New England. It also sent two truck loads of tires to the Yellow Taxicab Co. in Chicago, so it would not have to limit its operations because of lack of equipment.

Bay State Companies Adopt Truck Shipping

HOLYOKE, MASS., April 17—Direct auto truck shipping service between this city and New York is being worked out by several of the largest manufacturing concerns as a result of unsatisfactory service for months past. As a result of experiments reported as highly satisfactory during the past week, it is considered likely the service will be made permanent and taken up by other concerns.

William Skinner & Sons, silk manufacturers, are now shipping entirely by truck; the American Thread Co. is maintaining a truck line between this city, its plant at Willimantic, and its New York headquarters; the Germania Mills Co. recently placed a large van in commission between this city and New York and long distance shipping is also being taken up by the National Book Co., which is operating its own machines.

Joseph A. Skinner of William Skinner & Sons, is so satisfied that a third truck has been placed in commission. Three days is allowed for each trip, two trips a week being made. Trucks get an early morning start from the local plants, put up for the night at New Rochelle, N. Y., and are unloaded at the New York headquarters the following morning. Freight is brought back on the return trip.

SHIP CARS BY BARGE LINE

ST. LOUIS, April 19—Between St. Louis and New Orleans is a government-controlled barge line, and freight is being moved by the barges for through shipment to New York and the Atlantic coast and to South and Central America and to the Pacific coast and the Orient via the Panama Canal.

This service is being used by the Moon Motor Car Co., which is boxing motor cars in its factory in St. Louis, loading them on the barge line and shipping them direct to South American points.

The General Motors Co. also are expected to take advantage of the line.

AVERY TO BUILD TRUCK

PEORIA, ILL., April 17—The Avery Co. has made arrangements to add a one ton truck to its output of tractors and tractor and belt drawn machinery. Production probably will be started late this year. The truck will be designed especially to meet the needs of farmers and industrial firms. The trucks will be built in the plant of the Bartholomew Co. at Peoria Heights.

Patent Expiration Opens Chain Market

American Chain Co. Says Exclusive Weed Features Will Be Protected

NEW YORK, April 20—Life of the famous patent of Harry Parsons, known technically as No. 723,299, under which the Weed tire chains have been made for seventeen years, expired on March 24. Predictions of what will happen in the chain market as a consequence are unsafe. The American Chain Co., which succeeded the Weed Tire Chain Co., and purchased the Weed holdings several years ago, declined to-day to go into details as to its plans in this respect.

"In addition to the Parsons patent we own the Weed patent, No. 768,495, which covers a special form of tire chain which we and our predecessors, the Weed Tire Chain Co., have marketed since 1904 under the trade brands of Weed and Rid-O-Skid," said a representative of the company to-day.

He added that the Weed patent is superior to the Parsons and that it was not believed any serious inroads could be made in the company's business on the earlier patent but that "exclusive rights" would be protected in the courts if necessary.

It was explained that the original Parsons patent covered a chain put on in zig-zag fashion but that of Weed is one which goes straight across the tire.

The American Chain Co. pointed out that the making of tire chains is now only a small part of its business. It has factories at Bridgeport, Conn., York, Pa., Braddock, Pa., Columbus, St. Mary's and Mansfield, Ohio, Marion, Ind., and Norfolk, Va., in addition to the plant of the Dominion Chain Co. at Niagara Falls, Ont. It recently took over the plants of the Page Steel & Wire Co. at Adrian, Mich., and Monessen, Pa.

The chains of all kinds made by the company would aggregate in length 450 miles a day if placed end on end.

When the American company first took over the Parsons patent it paid a royalty to Weed but later purchased his holdings. He has not lost interest in the company, however, for early this month his son, Robert Weed, was married to Miss Martha Lasher, daughter of President W. B. Lasher of the chain company.

ALLIS-CHALMERS ADDS TO PLANT

MILWAUKEE, April 19—As part of a vast enlargement of its main works in West Allis, a suburb, to facilitate the development of its tractor business, the Allis-Chalmers Mfg. Co., Milwaukee, has started work on a new gray iron shop, 135 x 557 ft., which will be used exclusively for the tractor division. The design of the shop embraces some unusual features which are meant to make the foundry and its service to the machine and assembling shops a model of efficiency and economy in producing and handling materials and finished castings.

Vickers Experiments With Transmission

Janney - Williams Hydraulic Mechanism May Be Adapted for Use on Cars

LONDON, March 23 (*Special Correspondence*)—It is reported that the Crayford Works (near Erith) of the Vickers Co., are experimenting with the Janney-Williams hydraulic mechanism as a possible transmission for vehicles. This transmission, which is of American origin and has been used in marine steering gears, has been discussed for some years in British engineering circles, and papers have been read on it before the technical bodies.

Nothing, however, had been done with it in the practical sense before the war, and doubtless the partial success of the Compeyne hydraulic system as applied to ships' rudders, and more recently to certain forms of power hoists, is responsible for the present revived interest. That attempts to evolve an hydraulic variable transmission have not been lacking here is shown by a list of these systems tried and for the most part found lacking.

There was a rumor before the war that the Manly (American) hydraulic transmission was to be developed in Great Britain for Europe. About that time Dr. Hele-Shaw, who is interested in the Compeyne transmission, had a truck fitted with that system, the motors being direct coupled to the rear driving wheels.

INDIA MARKET EXPANDS

DETROIT, April 17—Ford Motor Co. of Canada in the last seven months has shipped close to 5000 cars to India, more than treble the number shipped in the year ending Aug. 31, 1919. Rough traveling in India is reflected in the frequent renewals of parts orders. One order received this week at the factory in Windsor called for many thousand dollars' worth of parts, the single order being sufficient to fill a good-sized ship.

All of the Ford cars shipped to India are built in the Canadian plant at Windsor, this plant supplying every country under British rule, save the British Isles, which is supplied from the factory in Manchester. In the Calcutta office of Ford Motor Co. there were said to be 2000 orders on file for cars, fulfillment of which was impossible because of lack of production and facilities for delivering.

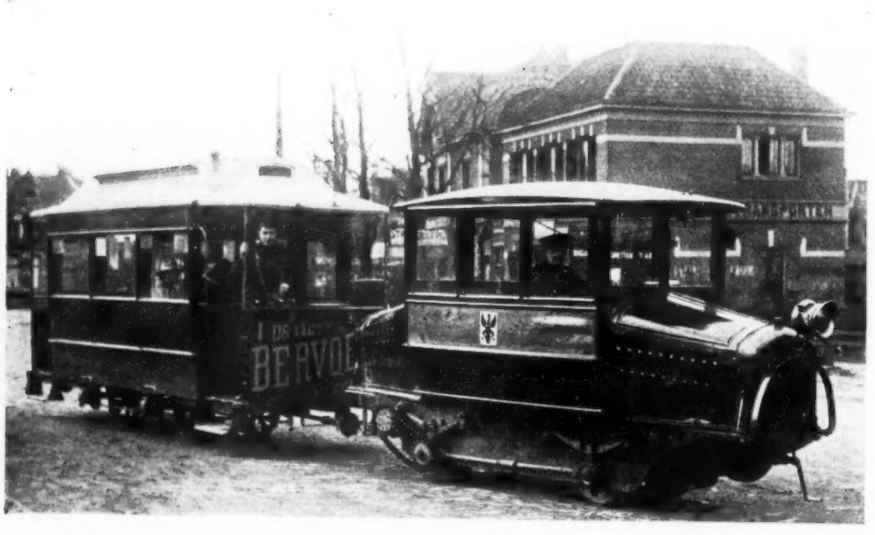
LEARD FACILITIES ENLARGED

NEW YORK, April 19—Additional and heavier equipment has been installed in the plant of the William Leard Co., at New Brighton, Pa., for rough turning and grinding crankshafts up to 96 in. in length and also additional equipment for finishing connecting rods up to 600 or 800 lbs. in weight. This company has recently been handling a considerable amount of crankshaft work for marine engine manufacturers and states that indications are better for large volume marine engine production than they have been for some time. Of the work now going through this plant a larger percentage is for marine engines than has been usual in the past.

FEDERAL RUBBER BUILDS

MILWAUKEE, April 19—A factory extension project involving an investment of approximately $500,000 in buildings and equipment has been undertaken by the Federal Rubber Co., at its main works in Cudahy, suburb of Milwaukee. Three new six-story buildings, 163 x 220 ft., of brick and steel construction, have been started and will be ready for production within 90 days.

Automobiles Popularize Dutch Tramcars



Wheels fitting the car tracks were adjusted and the automobile was used to haul the cars, sometimes singly, sometimes in trains, in the city of Apeldoonr, Holland. Since supplanting horses with the speedier traction power the cars have gained new popularity

Indianapolis Stops Plant Encroachments

Ordinance Prohibits Erection of Factories Within 500 Ft. of City's Boulevards

INDIANAPOLIS, April 17—Aiming at the Craig Hunt Motors Co., which proposed to erect a manufacturing plant at Meridian Street and Maple Road Boulevard, the Board of Park Commissioners, controlling the administration of the boulevards, has passed an order prohibiting "horse racing, gambling, offensive or dangerous business" within 500 feet of any of the city's boulevards in an effort to prevent the commercialization of residence districts under the jurisdiction of the board.

Automobile concerns, notably the retail district on Meridian Street, have made severe industrial encroachments on the boulevards and when the Craig-Hunt company announced its plan to erect a factory and service station at the juncture of the two boulevards in the heart of the city's most fashionable residence district, there was a general civic protest.

The Craig-Hunt company has issued a public statement pointing out the locations of other companies on the boulevards, all without protest, and asks why discriminate against it.

The city has become alive to these encroachments, and for the preservation of the future city beautiful, the park board has decided that industrial concerns cannot invade the residence districts.

DEERE ADDS PLANT SPACE

WATERLOO, IOWA, April 16—Improvements which will cost more than $500,000 and which will add 90,000 sq. ft. of floor space will be made by Deere & Co. at its plant here during the coming summer. Additions begun last fall have just been finished. When present plans are completed the company will have one of the most modern plants in the tractor industry.

The additions which will be erected during the summer are foundry building, cupola building, casting cleaning mill, service building, core room and foundry material storage yard with necessary railway tracks. The buildings will be of modern design.

AUSTRALIA TO REVISE TAX

NEW YORK, April 17 — Protection for new Australian industries is provided for in the new tariff bill which has been introduced in Parliament, it is announced by the trade commissioner here. Tariff increases ranging from 5 to 20 per cent on more than 500 items would be authorized with provision for deferred duties on several products, including iron and steel. British importations would be given preferential treatment and countries agreeing to reciprocity would have favored treatment.

Detroit Factories Back on Part Time

Forty Per Cent of Power Restored By Edison Company to Industry

DETROIT, April 20—Volunteer switching crews proved so successful, Detroit Edison Co. announced last night that 40 per cent power would be restored to factories to-day, resulting in resumption in practically every factory save Packard. The Packard company has been operating on its own power up to Saturday, when its fuel supplies were exhausted.

Though the order will return to work about 50 per cent of the 100,000 idle men, four and five hour shifts will be the rule for some time and production will be greatly curtailed. Dodge Bros., who had retained about 9000 of its 18,000 employees, resumed in all but fifteen departments, reducing the number idle to 4500.

Hudson-Essex resumed in all departments on a five hour schedule. Cadillac started plants No. 3 and No. 8, all employees working from 7 a. m. to noon. The night shift will work from 1 p. m. to 6 p. m. Sixteen departments in the main plant will work half day and fourteen departments full day. The time has been divided to benefit the greatest number of employees.

Fisher Body Corp. started all departments with a full force of employees, but will work only part time temporarily. At the Fordson Dearborn tractor plant work was resumed in nine departments on full time. Ford Motor Co., which had worked in part throughout the tie-up, using emergency power, will resume in all departments, using both Edison and the emergency power.

Studebaker Corp. resumed in eight departments. Hupp also resumed in some departments. Maxwell-Chalmers started about 50 per cent of its idle employees and will work half time temporarily. Paige, King, Columbia, Liberty, Nelson and Scripps-Booth will resume in all departments on part time. In the parts plants work is being resumed on about the same basis as in the car factories.

Coming just after record production in March the railroad tie-up has worked special hardship on the factories. Deliveries promised in April will be greatly reduced. This will work out especially hard on the dealers in the distant points, who were without cars all winter, and who were just beginning to get a few over the drive-away route.

The shut down of a full week is expected to work a further hardship in the Detroit factories owing to employees being spirited away to plants in communities less affected by the tie-up.

OAKLAND TO DOUBLE OUTPUT

PONTIAC, MICH., April 16—Production doubling that of the last four years is planned by the Oakland Motor Car Co. during the year beginning July 1, when the extensive building additions will have been completed and all departments of the plant are in operation in the immense new factory. Additions to the engine plant, the assembly department and a large four-story warehouse now are in course of construction and rapidly nearing the completed stage. It is planned to have a daily output of 320 cars when all departments of the factory are started in the new plants.

H. C. S. Selects Site for New Factories

INDIANAPOLIS, April 18—The H. C. S. Motors Co. will build its new plant at Fourteenth Street and Capitol Avenue. It will consist of two buildings, each a four story structure, with a 60-feet frontage and 200 feet in depth. One unit is being rushed to completion. When it is ready to occupy, work will be started on the other unit. The estimated cost is $500,000.

The H. C. S. Motors Company is now occupying a part of the Stutz Fire Engine Co. The business of the fire engine company demands all the room at its disposal. Since the perfect score made by the Stutz fire engines at the test in Kansas City many municipalities have placed orders for the Stutz engines.

The new Stutz plant will be modern in every way, with every convenience for employees. "At present we are bringing through our first car but we must have more room for a production of five to ten cars daily. We hope to be in the first unit by July 1," said President H. C. Stutz in a recent statement.

STRIKE DELAYS SUNBEAMS

NEW YORK, April 17—The molders' strike in Great Britain has seriously interfered with deliveries here of Sunbeam cars and Dario Resta, the American distributer, probably will not have more than 50 instead of the expected 100 cars to market in 1920. Twenty of these have been received. Despite the curtailed supply, Resta has appointed distributers in three cities, Durant in San Francisco, Caldwell in Boston, and Brainstetter in Chicago.

REMY EMPLOYEES GET BONUS

INDIANAPOLIS, April 18—The Remy Electric Co. of Anderson, on April 10, presented to 140 of its older employees shares of General Motors stock ranging in value from $400 to $700, to be delivered in a year. The stock will be presented annually as a bonus to older employees.

ADVERTISERS OPPOSE BILL

WASHINGTON, April 16—A protest against the Thompson bill which would impose a tax on advertisers has been sent to the House ways and means committee by representatives of the 21 departments of advertising who attended a meeting at Cleveland early this month of the National Advertising Commission.

G. M. C. Cuts Prices to British Buyers

Retroactive Reduction on Sales Since February 10 Sets Precedent Abroad

LONDON, March 25 (*Special Correspondence*)—According to the American Chamber of Commerce in London, the General Motors Co., Ltd., which is well known as one of the largest motor making organizations in the United States, has decided on an immediate reduction in the prices of its standard models. The chassis and cars affected by this decision are the Buick and Oldsmobile. The company has taken a step which is without precedent in the motor industry, in that they made the reduction retroactive from Feb. 10. Consequently all purchasers of such cars from that date will receive a very welcome refundment of £70, or about $350.

The British motor industry has received the announcement with mixed feeling, as the competition they are now facing will be greatly intensified, for, as the American Chamber points out, manufacturers in America have laid down 1,000,000 cars as their export program for this year, and even now there are 174 different makes of cars, excluding three-wheelers and cycle-cars offered for sale to British motorists, of which 75 only are of British manufacture, the rest being of American, Belgian, French, Dutch and Italian origin.

The announcement will, however, says the American Chamber, be very welcome to the general public as indicating that there is at least one industry in which prices can be reduced, which may to some extent have its effect on the cost of living, since motor transport is one of the factors determining that cost.

NEW YORK OFFICE NOT NOTIFIED

NEW YORK, April 13—No notice of the change in prices has been received at the offices here of the General Motors Export Corp. It was said the British company had full authority to make the reductions if conditions warranted. Whether similar reductions would be made on other cars of the General Motors group could not be learned.

FRANKLIN HAULS BY TRUCK

SYRACUSE, N. Y., April 19—The Franklin Automobile Co. kept its plant running at capacity during the railroad strike by bringing in raw materials on its own fleets of trucks from Buffalo, New York, Troy, Oriskany and other points.

MAXWELL PRICES ADVANCE

NEW YORK, April 20—Prices will be advanced $100 on all models of Maxwell cars and trucks on May 1. Word to this effect was received here to-day by the Maxwell-Chalmers branch.

War Department Tries Metal Planes

First of Four Ready for Tests at McCook Field—Details Withheld

NEW YORK, April 20—The War Department is experimenting seriously with the use of metal in military airplanes, it became known to-day. Details of construction have not been disclosed but one of the planes has been delivered at McCook field for test flights.

The machines, four in number, are being built at the plant of the Empire Aircraft Corporation at College Point, which is allied with the Empire Art Metal Co. The company is unable to describe the machines because a clause in its contract prescribes secrecy. It has been learned, however, that the planes closely resemble the JN type.

The fuselage is entirely of metal and there is a metal box wing beam as well as metal web. The wings are of ordinary airplane fabric. No information is available as to the metal used. It is understood, however, that duralumin which has been employed in German metal planes is not available in this country.

The Germans were pioneers in the use of metal in airplanes. Machines of this type were in use on a front a few weeks before the armistice and one of the Junker type was brought to this country but crashed at Mineola on a test flight. The British experimented with metal in a Bristol plane.

It is held that the chief advantage of the use of metal in a military plane is an added element of safety for the pilot. This is the main consideration for if a metal plane crashes it is almost certain to be damaged beyond repair.

LAWSON AIRCRAFT BUILDS

SOUTH MILWAUKEE, WIS., April 19—The Lawson Air Transportation Co., 425 East Water Street, Milwaukee, has awarded contracts for a brick and steel assembling shop, 72 x 162 ft., at its aircraft works in South Milwaukee. It is building twenty giant air liners for transcontinental passenger and express traffic, designed by Alfred W. Lawson, who last fall made a successful round trip in the first model to New York, Washington, and Baltimore and return to Milwaukee.

Traction Engine Exports, by Countries, During February

Countries	Gasoline Number	Gasoline Dollars	Kerosene Number	Kerosene Dollars
Bulgaria	3	4,136	....	....
Denmark	3	4,200	....	....
France	157	161,766	345	168,154
Hungary	....	....	6	11,020
Italy	8	11,000	....	....
Netherlands	5	3,000	....	....
Norway	15	19,660	96	14,247
Poland and Danzig	14	18,863	....	....
Portugal	3	10,839	....	....
Roumania	....	....	6	5,988
Spain	13	15,014	46	7,299
Sweden	23	18,350	....	....
England	12	20,943	803	207,420
Canada	512	445,419	575	484,185
Panama	1	976	....	....
Salvador	8	1,917	....	....
Mexico	35	74,491	6	5,265
Newfoundland and Labrador	....	....	7	5,653
Jamaica	3	2,100	1	100
Cuba	7	4,200	4	8,910
Haiti	4	25,695	....	....
Dominican Republic	3	13,665	....	....
Argentina	114	88,614	....	....
Brazil	10	2,199	2	135
Chile	63	31,999	....	....
British Guiana	6	8,302	....	....
Peru	48	20,750	....	....
Venezuela	....	....	7	4,900
British India	12	11,878	22	7,669
Dutch East Indies	12	24,868	....	....
Japan	2	7,675	....	....
Australia	2	3,170	70	5,510
New Zealand	26	26,336	....	....
Philippine Islands	4	7,650	29	4,992
British South Africa	25	25,549	5	6,306
French Africa	216	133,497	49	29,232
Portuguese Africa	1	1,914	....	....
Egypt	1	912	....	....
Totals	1,371	1,251,547	2,079	976,895

London-Paris Air Service May Stop

Failure of Government to Support Civil Aviation Develops Crisis in England

LONDON, March 25 (*Special Correspondence*)—According to the American Chamber of Commerce in London, the intentions of the British Government in regard to civil aviation as disclosed in the recent debate in the House of Commons have caused a sensation in aircraft circles. In two clearly defined sentences, the Secretary of State for Air told the whole story. "Civil aviation," he said, "must fly by itself. The Government cannot possibly hold it up in the air."

This announcement has been followed by the resignation of Holt Thomas, chairman of the Aircraft Manufacturing Co., Ltd., the originator of the famous London-Paris Air Service, the whole future of which is now at stake.

Thomas says that it is more profitable to produce other things than airplanes, and that the production of aircraft will in the future tend to be a mere side line unless assistance is given to finance the designing and building of experimental machines. The mail service between London and Paris is now in danger of collapsing as a result of the policy of the Government.

British public opinion has been aroused to such an extent, by the threatened collapse of civil aviation, the lack of funds with which to build experimental machines, and what this is likely to mean to the nation, that the Government has become alarmed, and have resuscitated the committee which formerly met to discuss what assistance, if any, should be given to civil aviation.

TO COMBINE FLYING CLUBS

NEW YORK, April 16—The first step toward the amalgamation of the Aero Club of America and the American Flying Club has been taken by the decision of the Board of Governors of the former organization to appoint a committee to seek a basis of understanding between the two. The American Flying Club was formed as the result of a break in the ranks of the Aero Club because army and navy pilots did not feel the organization properly represented the flying side of aviation. The newer club sponsored the New York-Toronto and coast-to-coast air races.

MACHINE COMPANY EXPANDS

DAYTON, April 16—The Recording & Computing Machines Co., has increased its capital to $4,000,000 to prepare for handling business on a large scale. Will I. Ohmer, president, announces that among the products now being manufactured are magnetos, generators, starters, battery ignition systems and small utility electric motors.

Holland Develops Aviation Division

Government Takes Over Interned Planes—Fokker to Build at Amsterdam

NEW YORK, April 16—The Dutch government is lending substantial support to aviation, but American manufacturers have not obtained a foothold there and there is little prospect they will be able to do so, according to a letter from the United States commercial attache at The Hague sent to the Manufacturers Aircraft Association by the State Department.

Holland has bought all the French planes which were interned in that country during the war and a large number of German machines interned there. When the American naval attache offered to sell the government a D-11 hydroplane he was informed Holland was not in the market at this time. It is believed the Dutch expect to obtain German machines of this general type at a lower price.

A committee of the directors of "Vickers House" at The Hague and several officers of the Dutch Indian army are making technical studies in the Vickers factories in England. The committee is preparing itself for the establishment of factories in Holland and the Dutch Indies as well as for the delivery of machines.

Airplanes and hydro-airplanes needed for military operations in the Indies have been ordered from Vickers factories. The Dutch government will subsidize a factory to be erected at Amsterdam by Fokker, although there is something of a revulsion of feeling against him because he renounced his Dutch citizenship during the war to build planes for use in military operations against the Allies.

The Dutch propose to establish an aerial mail service between Rotterdam, Flushing and the Zeeland islands. Another route under consideration is one from Holland to its East Indian colonies.

FORD VALVE PLANT STARTS

NORTHVILLE, MICH., April 16—Operations have been started in the new Ford factory where valves for Ford engines are being turned out. More than 100 men are employed in the plant. As soon as the weather permits work on the power dam which will form a 20-acre lake in this village will be started.

TURNER EXTENDS FACTORY

PORT WASHINGTON, WIS., April 19—Extensions aggregating 50,000 sq. ft. will be made to the foundry and machine shops of the Turner Mfg. Co. at Port Washington, Wis., to provide much-needed capacity for manufacturing Simplicity farm tractors, gas engines, etc. The site is provided largely by reclaiming three-quarters of an acre of land from Lake Michigan by the construction of a concrete seawall east of the present shops.

F. M. Smith, president and treasurer of the Turner company, has resigned and Francis Bloodgood, Jr., of Milwaukee, has been elected president.

W. J. Niederkorn, secretary and sales manager, has organized a company to take over the exclusive distribution of Turner tractors, engines and other products in the state of Wisconsin. Headquarters have been established in Port Washington. The present salesforce in Wisconsin is taken over and will be materially increased in size.

Goodyear Hall to Develop Tire Workers

AKRON, April 17—Goodyear Hall, the $2,500,000 recreational institution and industrial university of the Goodyear Tire & Rubber Co., was formally dedicated to-day. It is one of the most pretentious buildings ever erected for the welfare of employees.

The principal feature of the new building is the Industrial University with a faculty of 117. It already has an enrollment of 4700.

The university has 65 class rooms, four large laboratories and large assembly and lecture rooms. All forms of study are embraced in the curriculum from rudimentary grade school classes and Americanization classes for the foreign-born, to standardized collegiate post graduate courses for those desiring to round out incompleted college careers. A. C. Horrocks of Cleveland is dean. The 600 classes, arranged to accommodate all three daily eight hour shifts, are open to bona fide employees without tuition charges.

The hall also includes a large auditorium, a gymnasium, a cafeteria to feed 8000 daily, 12 bowling alleys, six rifle ranges, dormitory rooms and locker rooms.

AUSTRALIAN BUYS TRUCKS

NEW YORK, April 17—After a trip around the world to place an order for American built trucks, J. B. Clarkson, of Sydney, Australia, sailed for home this week. He was accompanied by Mrs. Clarkson. He has been around the globe fifteen times since he went into the bicycle business in Australia in 1903. He is now one of the largest importers of automotive equipment in his country and frankly admits the superiority of design of American automobiles and trucks. He spent much of his time in this country at the plant of the Dearborn Truck Co. in Chicago.

MICHELIN TIRES INCREASE

NEW YORK, April 17—Following are the prices of the Michelin Tire Co. for the more popular sizes: Non-skid, fabric casing, 30 x 3, $18.65; 30 x 3½, $23.00; 32 x 4, $36.90; non-skid, cord casing, 32 x 4, $55.50; 34 x 4½, $66.00; 35 x 5, $82.00.

Pic-Pic Post-War Models Arrive Here

Four-Cylinder Car at $6,200 Will Be Followed by 8-Cylinder Model Later

NEW YORK, April 15—The first sample of a Pic-Pic post-war model has been received in this country and is being exhibited by Spyros Papaspyros, the American general agent. The Pic-Pic was originally developed by Picard & Pictet of Geneva, Switzerland, and is fitted with a single sleeve motor, the sleeve having a compound movement. About a year ago all patent rights outside of Switzerland were purchased by the Gnome & Le Rhone Engine Co., who own large works in a suburb of Paris. Preparations have been made for a monthly production of 200 cars, and Papaspyros hopes to dispose of 15 a month in this country.

The model which has been received is a 4-cylinder machine with 3 5/16 by 5⅛ in. cylinders. It has a tax rating of 16 hp., but is claimed to develop 55 hp. The chassis alone sells at $6,200, and the complete car, with closed body, Westinghouse lighting and starting system, vacuum fuel feed, Houdaille shock absorber, etc., for $8,700. An 8-cylinder model with the same cylinder dimensions will also be built.

OBENBERGER ADDS TO CAPITAL

MILWAUKEE, April 19—The John Obenberger Forge Co., Milwaukee, has increased its capital stock from $500,000 to $750,000 to finance important extensions of the works in West Allis, a suburb. The company was established in August, 1916, by John Obenberger, a pioneer drop forge operator of Milwaukee. The original building was 100 x 100 ft. This is being enlarged to 100 x 330 ft., with an auxiliary building, 125 x 175 ft., a power house, 80 x 100 ft., and a warehouse and shipping building, 70 x 125 ft. The company specializes in automotive forgings, including crankshafts and camshafts for engines. It has on its books orders for more than $2,000,000 and expects a production valued at $3,000,000 in 1920, through additions now being erected and equipped.

COLUMBUS TIRE EXPANDS

COLUMBUS, April 19—Papers have been filed with the secretary of state increasing the authorized capital of the Columbus Tire & Rubber Co., from $800,000 to $1,275,000. The additional capital will be used to erect a large addition to the plant which is located on West Goodale St., Columbus. The present plant has a capacity of 1000 tubes and 2,000 tires daily which will be increased. John B. Brennan has been made executive head of the concern. He was formerly connected with the Ohio department of agriculture.

Production Slow in German Factories

Demand in Domestic Market Swamps Industry—Cars Lack Pneumatic Tires

WASHINGTON, April 19—Production that comes far from satisfying the home demand marks the present output of the automotive plants of Germany and Austria. This is revealed in the translation of a Spanish trade document just made public by the Bureau of Foreign and Domestic Commerce. Strikes and labor controversies, shortage of raw materials, high wages and the lack of skilled workers, particularly for such labor as the installation of the engines, are given as the causes for the low output. Most machines are promised for delivery in 1921.

The better known German cars, the report states, are commanding sales prices from 100,000 to 200,000 marks, with delivery uncertain. Smaller machines, such as the two-passenger, 8 hp., Wanderer, however, are quoted at some 40,000 marks, and are much in demand. Numerous factories have no cars at all for sale. In Austria, the Austro-Daimler is soon to be in production, with three models, one of which is a new six-cylinder.

"The production, in its reduced volume, can not satisfy even the domestic needs," the report states. "In Germany and Austria, during the war, no private person was allowed to have an automobile, with the sole exception of the few physicians who had not been mobilized. When the war ended, and with it the restriction, all those who had formerly owned automobiles wanted to have them again, and the demand consequently was much in excess of the supply. The State sold a large number of cars from the remaining war stocks, at prices rather high; nevertheless, there is a lively demand for new cars just coming from the factory.

Demand Causes Price Increase

"It is evident that this demand has tended to increase prices, even more than the exportation of automobiles, which, owing to the falling exchange value of the mark, requires an increase in prices if it is to be profitable. It is said that sales to foreigners will only be made in stable money. Austria is already pursuing this policy and demanding payments in Swiss francs. Another solution proposed is that adopted by the Publishers' Association, that of reckoning exchange at a fixed rate. Both of these methods tend to increase the prices.

"In addition, there is the tax and the export permit. Germany is now considering the introduction of a new tax of 25 per cent ad valorem. An export permit costs about 4,000 marks, and application for it must be made at Berlin. It takes from two to three weeks before a permit is issued.

"Nearly all the chassis are provided with electric starters, lights, and horns. The electric equipment, manufactured by Bosch, which is used on most of the good cars, costs 14,000 marks. Delivery is made f.o.b. factory, unless the contract provides to the contrary, but the cars lack pneumatic tires, as both countries are almost wholly bare of this article.

"The prices vary enormously with the terms of delivery, whether it is to be made immediately or at some future time. On the average, the manufacturers promise delivery in the spring of 1921. As a result, such cars as are finished and are ready for delivery command very high prices which for some types of cars are double the factory price.

Franklin Establishes Co-operative Store

SYRACUSE, N. Y., April 17—Employees of the H. H. Franklin Mfg. Co., acting co-operatively and for the present through a committee headed by George S. Dutcher, employment manager, will open a general store and market on May 1 to combat the high cost of living. The enterprise will be operated on a site adjacent to the Franklin plant, including a grocery store and meat market with stalls in the rear for a produce market. Prices will be fixed by a committee of Franklin workers. Two-thirds of the employees of the plant live within a radius of a mile from the site of the store.

The management will be exclusively under the direction of the Franklin employees who will finance it and supplies will be sold exclusively to Franklin workers. The store will keep in stock stable groceries, tea, coffee, smoked meats, tobacco, cigarettes, and articles of clothing such as overalls, working shirts and caps. It is expected to result in a saving of 20 per cent to the workers.

TRUCK TREATISES WIN PRIZES

CLEVELAND, April 16—The first prize of $1,000, offered by the Lakewood Engineering Co., for the best treatise on industrial haulage, using Lakewood Tier-Lift trucks, was awarded by the committee appointed by the Society of Industrial Engineers to Clarence Irving McNair, Jr., of Cloquet, Minn. McNair, who is secretary of the Northwest Paper Co. of Cloquet, won the prize with a paper entitled "Analysis of the Application of the Tier-Lift Truck to the Pulp and Paper Industry."

Second prize was awarded to F. C. Peters, chief mechanical engineer, and G. R. Reese, assistant mechanical engineer, New Jersey Zinc Co., Palmerton, Pa. Theodore M. Prudden of the Whitin Machine Works, Whitinsville, Mass., was awarded third prize for an analysis entitled "The Tier-Lift Truck—Its Field of Usefulness." F. L. Usner, with L. V. Estes, Inc., of Chicago, and Frederick L. Fish, industrial engineer with the Fisk Rubber Co., Chicopee Falls, Mass., were given honorable mention.

Propose Road Work Under New System

Experts Would Reconstruct All Highways on Scientific Basis —Politics to Be Ousted

NEW YORK, April 16—Highway organizations here and throughout the country are receiving many complaints of roads badly damaged by heavy truck traffic. The condition has been aggravated by the greatly increased truck business resulting from railway congestion and the necessity of getting goods distributed by the only reliable means at hand.

Even the most enthusiastic of good roads partisans did not foresee the tremendous development of motor truck transportation which has come in the last two or three years, but which still is in its infancy. The result is that roads built in the old style have been unable to carry the burden placed upon them.

There is apparent, however, no disposition to curb the use of trucks. The chief result thus far of road damage has been legislation enacted in several States to limit the weight of trucks and the loads they may carry. These limits, in some cases, are less than those set by the National Automobile Chamber of Commerce in its proposed uniform vehicle law, which fixes the maximum weight of vehicles at 28,000 lb. and of loads at 800 lb. per inch width of tire upon any wheel concentrated upon the surface of the highway.

The only solution seen by highway experts for a problem which is becoming manifest in all parts of the country is a reconstruction of the entire highway system, which will entail tremendous expense and which will have to be done gradually.

It is contended that only such types of materials as granite block, concrete and wood block should be used on the main arteries of travel, and it also is asserted with the utmost emphasis that with good roads building costing as much as it does now, routes should be laid out with regard only for economic considerations and the serving of the largest number of persons.

It is held that if the country is to be provided with a highway system adequate to its needs, highway building must be divorced absolutely from politics and political patronage. Enormous sums in the aggregate have been spent in the past in building good roads which serve only a few people and which are not likely to increase greatly in usefulness in the near future.

TIRE OUTPUT 85,000 A DAY

AKRON, April 16—Akron factories are turning out tires at the rate of 85,000 a day, according to figures compiled by the B. F. Goodrich Co. This is 25 per cent more than one year ago. When additions to Akron factories, now under way, are completed, production of 10,000 tires a day will be possible.

INDUSTRIAL NOTES

Du Pont Automobile Co. has awarded a contract for the erection of the initial building of its proposed new works at Prospect Park, near Philadelphia. The entire plant is expected to cost in excess of $1,000,000. Paul Du Pont heads the company.

Novo Co., Lansing, Mich., has received equipment for additions to its foundry plant and construction work is well under way. Completion is expected by June 1, increasing the output by 85 tons daily.

Taylor Motor Car Co.—Creditors are filing claims and efforts are being made to get litigation adjusted before plant at Fremont, Ohio, is taken over by company which recently purchased the property.

India Tire & Rubber Co., with plants at Akron and Mogadore, Ohio, expects to double its production of tires this year by the erection of an additional factory.

Latex Tire & Rubber Co., organized last May, already has erected the first unit of its plant at Fond du Lac, Wis., with a capacity of 300 tires and 700 tubes a day.

Menges Motor Truck Co., Greenville, Miss., has purchased Churchill compress grounds and warehouse for $100,000 and will soon begin manufacturing a motor truck.

Dixie Rubber Co., of which L. C. Cadenhead has been made manager, reports that it expects to invest $500,000 in its tire manufacturing plant at Memphis, Tenn.

Superior Tractor Co., Cleveland, has purchased for upwards of $200.000 twenty acres of land for erection of farm tractor plant to cost $125,000.

Floyd J. Logan Aviation Co., Cleveland, will erect an airplane garage with capacity for a dozen planes on a field seven miles from the city.

Allen Tire & Rubber Co., Allentown, Pa., has broken ground for large factory on Allentown-Bethlehem Pike.

Paragon Motor Car Co. hopes to have the first of its new 4-cylinder cars ready by August 1, next.

Wawasee Tire & Rubber Co. is planning the erection of a $600,000 plant at Syracuse, Ind.

Ajax Rubber Co. expects to break ground for its new factory at Sandusky about May 1.

TO ASSEMBLE CANADIAN CAR

MONTREAL, April 16—Organized for the purpose of assembling automobiles in Canada, the Forster Motor Car & Mfg. Co., Ltd., Montreal, has a capital of $1,000,000, divided three-fifths preferred and the remainder common. The company has purchased a plant having an annual capacity of 800 cars in Maisonneuve, a suburb of Montreal. It also has purchased the adjacent land on which it contemplates building a modern motor car factory late in 1920. A contract has been closed with Southgate, Ltd., London, for 10,000 chassis, worth $16,500,000, to be delivered within ten years. This company has the agency for this car in Great Britain, Ireland and India and will build its own bodies.

British Defer Change in Automobile License

LONDON, April 20 (*Special Cable*)—The British government has decided to defer until Dec. 31 abolition of the petroleum taxes and increased imposts on motor cars.

The change in the tax system was proposed by the Society of Motor Manufacturers and Traders. It would provide a more equitable burden for the English car owner, but he still would be taxed more heavily than the American.

Owners of motor vehicles in England now pay taxes in the form of an impost on fuel instead of paying registration fees. The Society of Motor Manufacturers and Traders recommended that a registration system be adopted to provide the $35,000,000 revenue which now comes from fuel taxes. It is this proposal which the government has decided to defer putting into effect.

Nebraska Dedicates Engineering Building

LINCOLN, NEB., April 17—The new $250,000 agricultural engineering building of the University of Nebraska was dedicated here yesterday. The American Society of Agricultural Engineers was represented at the exercises by a delegation of 25 members.

The chug-chug of farm tractors under test was plainly to be heard while the exercises were under way. At an informal meeting in the evening President Kranich of the engineers' society was the principal speaker and emphasized the importance of standardization in tractors. He held that tractors were purely farm machinery and that the problems connected with them should be solved by agricultural engineers exclusively.

Secretary Davidson of the society urged close co-operation with the National Implement and Vehicle Association.

APPERSON HOLDS ELECTIONS

KOKOMO, IND., April 21—Stockholders of the Apperson Bros. Automobile Co. have elected the following directors: Mrs. Elmer Apperson, Edgar Apperson, A. G. Dawson and T. E. Jarrard. The directors later elected Edgar Apperson president, Jarrard vice-president and Dawson secretary-treasurer. Because of the long illness of Elmer Apperson, which ended with his death at Los Angeles, no changes in the management of the company will be necessary.

METAL MARKETS

Pig Iron.—Pending return of normal transportation facilities, producers and sales agents are disposed to let previous quotations for foundry irons continue as nominal price levels. While no new business has been placed, purchasing agents in the automotive industries are reported to have put out inquiries for third quarter deliveries.

Iron and Steel.—Steel output has been impaired as the result of the railroad tie-up, but not to the extent that might have been expected. The Bethlehem Steel is operating to the extent of 75 per cent capacity, which is about normal and, while a few plants are turning out only a quarter of their regular production, the dent put into output as a whole will barely exceed half a week's production which, if the worst is over, can be easily made up. Some of the independent producers of automobile sheets are reported having considerable of their third quarter capacity unsold, and, in some instances, it is said that even part of their second quarter production is still available.

Aluminum.—The market continues very firm at 33 cents for virgin ingots, 98 to 99 per cent pure. Several lots of French aluminum have arrived at New York of late, but in spite of reports that in the so-called "outside" market lower prices prevail, consumers find it impossible to shade 33 cents for reputable brands. The French metal coming in is reported to have been sold in advance and there is no disposition on the part of the foreign producers to cut the prices of the American company. There are a number of odd lots of imported aluminum on the market, consisting either of American metal which, because of the exchange situation, it paid to reimport from Europe, or of nondescript ingots for the purity of which there is no guarantee. It is possible that these lots may be obtained at as low as 31 and 32 cents. But the market for strictly virgin aluminum is as firm as ever. Rolled aluminum is in excellent demand.

Copper.—The market is dormant with producers quoting 19¼ and 19½ cents, but ample supplies obtainable in the resale market at 18½ cents for electrolytic, 18⅜ cents for casting and 19 cents for Lake.

Lead.—The market is quiet at 9 and 9¼ cents, New York basis.

Zinc.—Very little demand is noted, with prices on the toboggan. Prime Western is quoted at around 8.35 cents, East St. Louis.

Brass.—The principal manufacturing interest in the Connecticut brass valley has every roll turning, and if labor were plentiful would have a night shift. All brass produced is for domestic use, much of it for the automotive industries which maintains a steady demand. Prices show little change, remaining at about the same level as last week and for some time past.

Automotive Financial Notes

General Aluminum & Brass Manufacturing Co. is offering $1,000,000 in 8 per cent cumulative preferred on the market; has filed its balance sheet showing current assets of $2,030,153.26 and current liabilities of $395,773.47. Total assets are $3,285,280.45. Net sales during 1919 were $4,482,205.34, and profits after interest and federal taxes were $304,354.07. The issue just placed on the market is to be devoted to the increase in working capital and to provide for necessary expansion facilities.

Linderman Steel & Machine Co., Muskegon, reported surplus profits of $565,289.31 at the end of the fiscal year Dec. 31. Total assets are $4,831,648.73, of which $933,881 is cash and securities; $1,701,541.56 accounts and notes receivable; $548,951 materials and $305,592 plant and equipment. The company reserved $1,300,000 out of earnings for 1920 taxes. Preferred stock outstanding is $590,000 and common $1,068,000.

Republic Rubber Co.—Balance sheet of Feb. 29 showed current assets of $10,735,567 and current liabilities of $5,684,140. President Jones reports economies in administration and overhead will permit saving of $1,000,000 annually and that business soon will be "on an earning basis."

Fisk Rubber Co.—Annual report shows surplus after Federal taxes of $3,994,657, equivalent after deduction of preferred dividends to $5.99 a share ($25 par value) as compared with a surplus of $2,506,853, or $19.50 ($100 par value) earned on $8,000,000 common stock in 1918. Net sales in 1919 were $43,613,975.

McIntyre Motor Sales Co., incorporated at Kalamazoo with capital of $250,000 to manufacture and sell internal combustion engines, automobiles, tractors and trucks. Frank W. Holmes and W. H. McIntyre, Kalamazoo, are the largest stockholders.

Hood Rubber Co.—Understood company will pay cash dividends of at least 6 per cent on common as increased by 66 2/3 per cent stock dividend. This would be equivalent to 13⅓ per cent on old issue of $3,000,000.

Bukolt Mfg. Co., Stevens Point, Wis., is increasing its production of highway tire protectors from 40 sets daily to 100 sets. The device has been improved by the use of an outer blanket of rubber over the metal tread.

Truscon Steel Co. stockholders have approved distribution of a 20 per cent dividend in stock to holders of record March 31. The directors also have paid the April quarterly dividend of 4 per cent in cash.

White Motor Co. stock is showing unusual strength as the result of the impression that the $4 annual dividend rate is to be increased and the report that the company may also declare the stock dividend.

Timken Roller Bearing Co. expects to be employing 3000 men in its Columbus branch within a year. More than 1000 men already are at work and are turning out 1500 assembled bearing cases daily.

Ryan-Bohn Foundry Co., Lansing, Mich.—Incorporated with $2,000,000 to do a general foundry and machine business, specializing in automobile parts.

Mason Tire & Rubber Co.—Reports sales for March of $1,067,000, largest single month in its history. Has absorbed Mason Cotton Fabrics Co., which is now known as textile division.

Pan Motor Co.—Authorized by Minnesota State Securities Commission to sell $2,000,000 of its preferred stock in that State, the proceeds to be used as manufacturing and working capital.

Northway Motors Corp.—Northway Guaranty & Deposit Corp., organized in Massachusetts particularly to discount notes of Northway Motors Corp., capitalized at $12,000,000.

J. I. Case Threshing Machine Co. has purchased the foundry of the Universal Machinery Co., Milwaukee, to provide much needed gray iron castings for its automotive works.

Stewart-Warner Speedometer Corp.—President C. B. Smith reports sales for first quarter amounting to $3,942,000, compared with $2,074,000 for the same period in 1919.

The Mura Motors Corp., New York.—Incorporated with an active capital stock of $220,000 by G. W. Rollo, E. F. Hills, and D. Robinson to manufacture automobile engines.

General Motors Corp.—Plans to give stockholders the right to subscribe to 3,000,000 shares of new stock at $30 a share to the extent of 20 per cent of their holdings.

Morris Bros., Racine, Wis., brass founders, have acquired a building at Fond du Lac which is being equipped for both brass and aluminum casting.

Liberty Wheel Co., Greenville, O.—Incorporated with capital of $75,000 to manufacture automobile and truck wheels.

Snap-On Wrench Co., Milwaukee, is a new company formed to manufacture and sell patented wrenches and other tools.

Columbus Tire & Rubber Co.—Capital increased from $800,000 to $1,275,000 to erect large addition to plant at Columbus.

All-Tite Chain Co.—Being organized in Milwaukee by F. E. A. Hoya to build a factory at Cedarburg, Wis.

Russell Motor Car Co.—Declared quarterly dividend of 1¾ per cent on both preferred and common stock.

Lee Rubber Co.—Reported that directors will decide upon resumption of dividends at meeting April 29.

Nycla Rubber Co., Elyria, Ohio.—Incorporated with $200,000 capital by C. C. Bowers and L. F. Bowells.

Acme Motor Parts Corp., Milwaukee, has added $50,000 to its capital in order to enlarge production.

Akron Universal Tire & Rubber Co., Medina, Ohio.—Incorporated with capital of $515,000.

Kelsey Wheel Co.—Declared quarterly dividend of 1¾ per cent on preferred stock.

Bank Credits

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co, second largest bank in America.*

The raising of the Bank of England's minimum rate of discount to 7 per cent, and of that of the Bank of Japan to 10 per cent calls attention sharply to the world-wide shortage of credit. The current yields on Government securities, as well as on those of corporations, meanwhile, reflect the shortage of a long-term capital. The late spring normally sees easier money and credit liquidation, and it will, therefore, be of interest to watch developments this year as furnishing an index of what may be expected when the usual heavy fall demands for money begin.

In this connection it is worth noting that at a time of the year when Western banks are usually in a position to send money to New York, the Federal Reserve banks of Chicago, St. Louis, Minneapolis and Kansas City are borrowing more than $58,000,000, while New York and Boston are lending more than $72,000,000.

There are no present indications of further movements of gold either into or out of the country.

DAIMLER EXTENDS INTERESTS

NEW YORK, April 20—Through action taken at a general stockholders' meeting held in Stuttgart on March 15, the Daimler Motor Co. has taken over control of the Esslingen Machinery Mfg. Co. The Frankfurter Zeitung reports that the deal was effected by issuing preferred 4 per cent stock to the amount of 4,000,000 marks by each company and then exchanging it. In future stockholders' meetings the Daimler preferred stock will possess a voting power 16 times as great as indicated by its face value. During the war the Daimler company was one of the greatest profiteers in Germany, and was the object of several interpellations in the Reichstag, but since the armistice its affairs have gone very badly. William Hohenzollern is said to be a big stockholder in this concern.

TO EXTEND THEFT BUREAU

NEW YORK, April 20—With the increasing number of automobile thefts, the automobile insurance companies have concluded plans for a nation-wide extension of their detective bureau. The bureau already has branch offices in a number of cities in the East.

The report made by the bureau for the fiscal year ended Feb. 1 shows that the automobiles stolen during the year had an insurance value of $5,000,000.

Men of the Industry

H. B. Edwards, who in the horse days was Detroit manager for a buggy company, has been made Detroit branch manager for the Studebaker Corp. of America. Edwards is well known in Detroit and two of his old clerks in the buggy store were Barney Everitt and H. S. Firestone.

W. J. Norwich, general manager of McMullen & Lee Co., Ltd., Studebaker distributers in Toronto, has resigned to become sales manager of the Disappearing Propeller Boat Corp., formed recently to merchandise standardized motor boats.

Frank H. Wilson, who during the war was chief of production for the Detroit office of the government air service, has been appointed supervisor of purchasing for the Lincoln Motor Co. George E. Carpenter will remain with the company as assistant to Wilson.

W. Colburn Standish, for a number of years head of the United States Tire Co., Detroit branch, has left that organization to enter the lumber business and will become treasurer and sales manager of the W. A. C. Miller Co.

James A. Braden, advertising manager of Standard Parts Co., will sever his connection with that company May 1. He will be succeeded by Ralph W. Leavenworth, formerly assistant manager.

Arthur Kirkland, former sales engineer of the Detroit Tool Co., is now manager of the Cleveland office. He will be in charge of sales of the Sanford Precision Centerless Cylindrical Grinding Machine.

C. E. Canright, who for five years has been associated with an automobile equipment factory in Milwaukee, has been made sales manager of Kol-Ben Wheel Co., at Cadillac, Mich.

L. M. Van Riper has been named Michigan district manager for the Ajax Rubber Co. of New York, with headquarters in Detroit. His territory also includes all of northern Ohio.

A. R. Barbier, formerly with Packard Motor Car Co. and Power Alexander & Jenkins, has joined the staff of Frank Eastman, advertising manager of Lincoln Motor Co.

George Zwergle, formerly factory representative of the Republic Truck Co., has been appointed director of sales for the newly-organized Transport-Utilitor Sales Co., in Toledo.

L. D. Graham, formerly wholesale distributer for Apperson Bros., has been made general sales manager of the Denby Motor Truck Co., succeeding Percival Dodge.

C. D. Fleming, for several years in charge of cost accounting for the Studebaker plants in Detroit, has been made treasurer of the Cleveland Tractor Co., in charge of finance and accounting.

Alfred Lucking, general counsel for the Ford Motor Co., has resigned from that post but will continue as personal attorney to Henry Ford.

Charles E. Roney has been named sales manager of the Starkweather Co., distributers of Artcraft tops in Michigan, northern Ohio and Indiana.

George A. Stracke has taken charge of the advertising department of the Standard Motor Truck Co. Stracke formerly was with Campbell-Ewald and recently has conducted a retail agency in Saginaw.

D. W. Burke and W. J. Burns have organized the Automotive Engine Parts Co., to handle official distribution of Continental engines and Borg & Beck clutch parts for Michigan.

T. O. Stapler has been elected vice-president of the Missouri Moline Plow Co., of St. Louis.

T. M. Russell, president of the Russell Mfg. Co., has been elected president of the Middletown, Conn., Chamber of Commerce.

O. S. Barrett has been appointed advertising manager of the Studebaker Corp., automobile division, South Bend.

T. S. Lindsey, formerly New York branch manager and eastern district manager of the Kelly-Springfield Tire Co., has been made a special representative of the company's sales department.

Vernon E. Bush has been named manager of the export sales division of the Republic Motor Co., Inc., Alma, Mich.

Raymond E. Plimpton, formerly publication manager and field secretary of the society of Automotive Engineers, has joined the Sales Advertising Co., of New York.

Maxwell C. Maxwell, formerly assistant general superintendent of the Yale & Towne Manufacturing Co., has been named general superintendent.

FISK DINES OFFICIAL

SPRINGFIELD, MASS., April 17—Everett M. Bogardus, controller of the Fisk Rubber Co., who is to remove to New York as an associate of H. T. Dunn, president of the company, was given an informal dinner this week at the Oxford Country Club, Chicopee Falls, by 40 of his colleagues. Guests included officers of the company, many of the department heads and Col. A. F. Foote of Holyoke, head of the state department of public safety. Mr. Bogardus, who has been with the company for more than a quarter-century, was given a diamond scarfpin.

ASPHALT ASSOCIATION MEETS

NEW YORK, April 16—George Otis Smith, director of the United States Geological Survey addressed the annual meeting of the Asphalt Association at the Engineers Club here this week. He stressed the importance of considering the production of petroleum and its by-products from the standpoint of quantity rather than cost. He pointed out that while there has been an increase each year in the production of petroleum the demand always outruns the increase. Director Smith characterized paving as essential to the transportation system of the country. Reports which were presented showed that in 1919 approximately 60,000,000 sq. yds. or about 6,000 miles of asphalt pavement was laid in the United States.

J. R. Draney of the United States Asphalt Refining Co. was elected president of the association.

Frank New President of Rauch & Lang

CHICAGO, April 16—Paul A. Frank has retired from the Magnetic Motors Corp. to become president of Rauch & Lang, Chicopee Falls, Mass., manufacturers of electrics. He is only 32 years old and will be one of the youngest automobile executives in the country. He started his business career as a motor car salesman.

Frank and Ray S. Deering, who recently was elected president of the Stevens-Duryea Co., formed a partnership five years ago to deal in used electric automobiles, beginning in a modest way. They soon added other lines and took on the agency for Rauch & Lang. Later they added the Owen Magnetic and just before the war began manufacturing a magnetic car of their own called the Deering. The war made it impossible for them to make contracts for parts and accessories, however.

Both Frank and Deering will retain an interest in the retailing business of the Deering Magnetic Co. in Chicago, but the active management has been turned over to Bruce E. Adams, who is succeeded as sales manager by Richard S. Griefen.

WELDING SOCIETY MEETS

NEW YORK, April 22—The annual meeting of the American Welding Society is being held to-day in the Engineering Societies building. The business session, with a discussion of proposed amendments to the constitution, and election of officers, took up the morning hours. The afternoon meeting will be devoted to a discussion of welded joints for pressure vessels. Three papers will be read at the evening session. They will be "Speed of Metal Arc Welding," by William Spraragen, University of Washington; "Automatic Arc Welding Machines," by H. L. Unland, General Electric Co., and "Recent Development in Gas Cutting," by Stuart Plumley, of the Davis-Bournonville Co.

CIVILIANS BUY PLANES

NEW YORK, April 16—Henry Woodhouse, president of the Aero Club of America, announced in his annual report that civilians have acquired about 4000 surplus military airplanes in the last nine months.

Calendar

SHOWS

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

Dec. 10-18—New York. Motor Boat Show. Grand Central Palace.

FOREIGN SHOWS

May 15-June 13 — Cars, Parts and Accessories. Antwerp.

June 26-July 25 — Commercial vehicles, tractors, camions and engines. Antwerp.

July 9-20—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.

Aug. 7-Sept. 15 — Motorcycles, sidecars, etc. Antwerp.

October—London. Commercial Vehicle Show, Olympia.

November—London. Passenger Car Show, Olympia.

CONTESTS

May 1—Hanford, Cal. Dirt track.

May 31 — Indianapolis, Ind. Speedway.

May 31—Brockport, N. Y. Dirt track.

June 1—Omaha, Neb. Truck Reliability Run.

June 12—Uniontown, Pa. Speedway.

June 17—Portland, Ore. Dirt track.

June 19—Ogdensburg, N. Y. Dirt track.

July 4—Tacoma, Wash. Speedway.

July 4—Hanford, Cal. Dirt track.

July 4—Spokane, Wash. Dirt track.

July 5—Batavia, N. Y. Dirt track.

July 17 — Warren, Pa. Dirt track.

July 24—Watertown, N. Y. Dirt track.

July 31—Fulton, N. Y. Dirt track.

Aug. 7—Erie, Pa. Dirt track.

Aug. 14—Buffalo, N. Y. Dirt track.

Aug. 20-21—Middletown, N. Y. Dirt track.

Aug. 21—Johnstown City, Pa. Dirt track.

Aug. 28—Canandaigua, N. Y. Dirt track.

Aug. 27-8—Flemington, N. J. Dirt track.

August, 1920—Paris, France, Grand Prix Race. Sporting Commission Automobile Club of France.

Sept. 1—Glidden Tour—N. Y. to San Francisco.

Sept. 5 — Targa Florio Race, Sicily.

Sept. 6—Hornell, N. Y. Dirt track.

Sept. 6—Cincinnati, O. Speedway.

Sept. 6—Uniontown, Pa. Speedway.

Sept. 17-18—Syracuse, N. Y. Dirt track.

Sept. 25—Allentown, Pa. Dirt track.

Oct. 1-2—Trenton, N. J. Dirt track.

Oct. 8-9—Danbury, Conn. Dirt track.

CONVENTIONS

April 27-29—Atlantic City. Increased Production Convention, Chamber of Commerce of the United States.

April 29-May 1—Detroit, Mich. Fourth Annual Meeting and Convention, American Gear Manufacturers Ass'n.

May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

May 20-30—Atlantic City. Third American Aeronautic Congress, Aero Club of America.

May 24-26—Indianapolis, Service Managers' Convention. National Automobile Chamber Commerce, Service Division.

June 7-10 — Indianapolis, Ind. Annual Convention of the Associated Advertising Clubs.

June 7-11 — Del Monte, Cal. Automotive Equipment Association, Directors' Meeting, 7-8; General Sessions 10-11.

June 22-25—Asbury Park, N. J. Annual meeting American Society for Testing Materials.

S. A. E. MEETINGS

June 21-25 — Ottawa Beach, Mich. Summer Conference.

Mason Plans Housing for Girl Employees

KENT, OHIO, April 16—A dormitory which will contain 20 five-room apartments will be erected by the Mason Tire & Rubber Co., to house properly the girls who will be employed in its textile division. The dormitory will cost approximately $100,000.

Each five-room apartment will have a kitchen, a dining room and a living room on the first floor, and two bedrooms and a bath on the second floor, with a laundry in the basement.

The plans of the dormitory are distinctive in that they provide for the housing of the girls in small families where they can live economically and in family style.

There is to be one large room in the center of the dormitory, where social events, dances and any general function can be held by the girls living in the dormitory.

Plans have been drawn and construction is to start at once upon a welfare, labor, employment and timekeeping building, to be located just east of the restaurant. This building will have rooms equipped with shower baths both for men and women.

The Mason company is making extensive additions to its plant. The textile division already has been completed and several other buildings will be started at once.

LA CROSSE FOUNDRY TO OPEN

LA CROSSE, WIS., April 19—The Automotive Foundry Co. of La Crosse, Wis., a new $100,000 corporation, is pushing work on a new gray iron foundry, 100 x 220 ft., the output of which will be absorbed largely by the La Crosse Tractor Co., which thus will be able to greatly enlarge its output, restricted to some extent by the difficulty of obtaining an adequate supply of castings from present independent sources. O. B. Dibble is president, and A. A. Rasmussen, secretary and works manager of the Automotive Foundry Co.

Western Syndicate Plans Air Service

CINCINNATI, April 16—The Western Air Line Syndicate has been organized in Cincinnati for the purpose of placing airplane transportation lines in operation between the cities of the Middle West. The capitalization is $2,000,000 and a charter will be asked of the secretary of state next week.

Contracts for carrying the United States mails will be sought by the new company. Fred M. Renshaw, traffic department of the Chamber of Commerce, is working with the Chamber of Commerce in other Middle West cities to ascertain from manufacturers just what tonnage is available for these lines and its class.

Those who joined in organizing the company included officials of the Cincinnati Aircraft Co., members of the Chamber of Commerce of Cincinnati, and the following out-of-town men: O. C. Johns, Erie; F. C. Wells, Chicago; W. A. Hubbard, Louisville; Frank Bernstein, Indianapolis; C. C. Berry, St. Louis, and G. F. Thomas, Cleveland.

LAKES TRUCK LINE STARTS

DETROIT, April 17—Diamond T Motor Car Co. of Chicago, is operating a regular fleet of trucks between the Windy City and Detroit, the first units of the fleet reaching Detroit yesterday.

Brooklyn Products Shown at Exhibit

NEW YORK, April 19—A score or more of Brooklyn manufacturers doing an automotive parts or equipment business exhibited at an industrial show held last week in the 23rd Regiment armory, that city. There was no effort to feature the automotive side of the city's manufacturing exhibitors showing specialties in their own particular lines.

Among automotive exhibits were Klaxon, showing horns; Curran radiators, Caille Liberty drive motors for boats, the Generator Valve Co., James carbureters and tire pump. John Folachek, bronzes; Murcott and Campbell, files; Penn Brass & Bronze Co., Adriance Machine Works, showing a staggered feed press; Duplex Engine Governor, Merrill Bros., drop forgings; E. W. Bliss, Doehler Die Casting Co., Taylor & Co., Beach Russ & Co., cutting machines; Thomas Paulson & Son, castings, Hecla antifriction bronze; William Vogel & Bros., cans; E. Reed Burns Supply Co., Hay Hudden Mfg. Co., anvils.

T. R. Brawley, Eastern Tube & Tool Co., Eisemann Magneto Co., Estey Bros., Fairbanks, Morse & Co., Fulton Foundry & Machine Co., Greenpoint Belting Co., Hilo Varnish Co., Irving Iron Works, Laurence Belting Co., New York Leather Belting Co., the Peelle Co., Reliance Metal Spinning & Stamping Co., Inc., J. W. Richardson Foundry & Metal Corp., the V. & O. Press Co., Valentine & Co., William Vogel & Bros., Inc., Wahlstrom Tool Co., and J. H. Williams & Co.

The exhibit was opened on Monday by H. H. Doehler, president of the Doehler Die Casting Co., his associates in this ceremony being Frank H. Moses, of the Adriance Machine Works, and J. O. Skinner, of the E. W. Bliss Co.